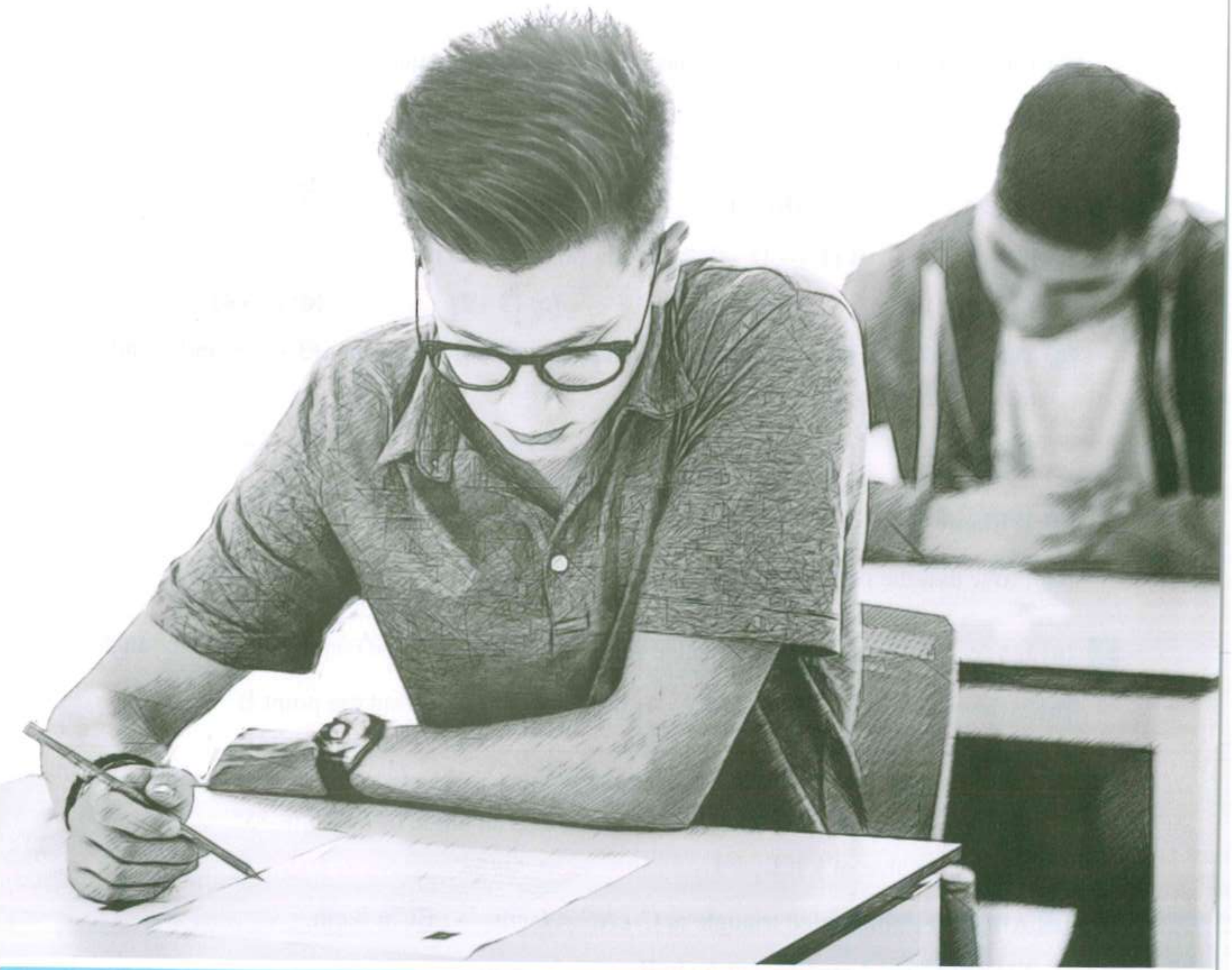
2022

Final Examinations

on Trigonometry and Geometry



Model 1

Answer the following questions :

1 Choose the correct answer from those given :

1 $\tan 45° =$ ....

(a) 1 (b) $2\sqrt{2}$ (c) $\frac{1}{2}$ (d) $\sqrt{2}$

2 If $\sin X = \frac{1}{2}$, X is an acute angle , then $m(\angle X) =$ ....

(a) 45° (b) 60° (c) 30° (d) 90°

3 The distance between the two points (3 , 0) and (0 , – 4) equals .... length units.

(a) 4 (b) 5 (c) 6 (d) 7

4 If $x + y = 5$, $k x + 2 y = 0$ are perpendicular , then k = ...

(a) – 2 (b) – 1 (c) 1 (d) 2

5 If A (5 , 7) , B (1 , – 1) , then the midpoint of $\overline{AB}$ is ....

(a) (2 , 3) (b) (3 , 3) (c) (3 , 2) (d) (3 , 4)

6 The equation of the straight line which passes through the point (3 , – 5) and parallel to y-axis is ....

(a) $x = 3$ (b) $y = -5$ (c) $y = 2$ (d) $x = -5$

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2 [a] **Without using calculator , prove that :** $\sin 60° = 2 \sin 30° \cos 30°$

[b] Prove that the points A (– 3 , – 1) , B (6 , 5) and C (3 , 3) are collinear.

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3 [a] If $4 \cos 60° \sin 30° = \tan x$, find the value of x , where x is the measure of an acute angle.

[b] If the midpoint of $\overline{AB}$ is C (6 , – 4) where A (5 , – 3) , find the point B

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4 [a] If the straight line L_1 passes through the points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the x-axis an angle of measure 45° , find the value of k if $L_1 // L_2$

[b] ABC is a right-angled triangle at C , AC = 6 cm. , BC = 8 cm.

Find : 1 $\cos A \cos B - \sin A \sin B$

2 $m(\angle B)$

5 **[a]** Find the equation of the straight line whose slope is 2 and passes through the point (1 , 0)

[b] Prove that the points A (3 , – 1) , B (– 4 , 6) and C (2 , – 2) which belongs to an orthogonal Cartesian coordinates plane lie on the circle whose centre is M (– 1 , 2) Find the circumference of the circle.

Model 2

Answer the following questions :

1 **Choose the correct answer from those given :**

1 $2 \sin 30° \tan 60° =$ ....

(a) $\sqrt{3}$ (b) 3 (c) $\frac{\sqrt{3}}{3}$ (d) $\frac{1}{2}$

2 The equation of the straight line which passes through the point (– 2 , – 3) and parallel to X-axis is ....

(a) $X = -2$ (b) $X = -3$ (c) $y = -2$ (d) $y = -3$

3 If $\cos X = \frac{\sqrt{3}}{2}$, X is the measure of an acute angle , then $\sin 2X =$ ....

(a) 1 (b) $\frac{\sqrt{3}}{2}$ (c) – 2 (d) $\frac{1}{\sqrt{3}}$

4 A circle of centre at the origin point and its radius length is 2 length units , which of the following points belongs to the circle ?

(a) (1 , – 2) (b) $\left(-2 , \sqrt{5}\right)$ (c) $\left(\sqrt{3} , 1\right)$ (d) (0 , 1)

5 The perpendicular distance between the two straight lines : $X - 2 = 0$, $X + 3 = 0$ equals .... length units.

(a) 1 (b) 5 (c) 2 (d) 3

6 If $\frac{-3}{2}$, $\frac{6}{k}$ are the slopes of two parallel straight lines , then k = ...

(a) 6 (b) – 4 (c) $\frac{3}{2}$ (d) 2

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2 **[a]** If $\cos E \tan 30° = \cos^2 45°$, **find :** m (∠ E) , E is an acute angle.

[b] Show the type of the triangle whose vertices are A (3 , 3) , B (1 , 5) and C (1 , 3) due to its side lengths.

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3 **[a]** Find the equation of the straight line which passes through the points (1 , 3) and (– 1 , – 3) and prove that it is passing through the origin point.

[b] If the point (3 , 1) is the midpoint of (1 , y) , (X , 3) , find the point (X , y)

4 [a] Find the equation of the straight line which intercepts from the two axes two positive parts of lengths 1 and 4 for x and y axes respectively and find its slope.

[b] ABC is a right-angled triangle at B , AC = 10 cm. and BC = 8 cm.

Prove that : $\sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

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5 [a] Prove that the straight line which passes through the points $(-1, 3)$ and $(2, 4)$ is parallel to the straight line : $3y - x - 1 = 0$

[b] ABCD is a trapezium , $\overline{AD} \parallel \overline{BC}$, $m(\angle B) = 90°$, AB = 3 cm. , BC = 6 cm. and AD = 2 cm.

Find : The length of $\overline{DC}$ and the value of $\cos(\angle BCD)$

Model for the merge students

Answer the following questions :

1 Put (✓) or (✗) :

1. The distance between the points (9 , 0) , (4 , 0) equals 5 length units. ( )
2. If tan E = 1 , then m (∠ E) = 45° ( )
3. The straight line $y = 2x + 1$ intercepts a part of length – 1 from y-axis ( )
4. If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$, then the slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{CD} = 1$
   (both of $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ aren't parallel to any axis) ( )
5. $\tan 60° = \frac{1}{\sqrt{3}}$ ( )
6. If A (1 , 2) , B (3 , 4) , then the midpoint of $\overline{AB}$ is (2 , 3) ( )

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2 Choose the correct answer from those given :

1. The distance between the point (4 , 3) and x-axis is .... length units.
   (a) – 3 (b) 3 (c) 4 (d) – 4
2. $4 \cos 30° \tan 60° =$ ....
   (a) 3 (b) $2\sqrt{3}$ (c) 6 (d) 12
3. If $x + y = 5$, $kx + 2y = 0$ are parallel , then k = ...
   (a) – 2 (b) – 1 (c) 1 (d) 2
4. The points (0 , 1) , (3 , 0) and (0 , 4) ....
   (a) form a right-angled triangle. (b) form an acute-angled triangle.
   (c) form an obtuse-angled triangle. (d) are collinear.
5. If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{2}{3}$, then the slope of $\overleftrightarrow{CD} =$ ....
   (a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{-2}{3}$ (d) $\frac{-3}{2}$
6. If $\sin x = \frac{1}{2}$, x is the measure of an acute angle , then $\sin 2x =$ ....
   (a) 1 (b) $\frac{1}{4}$ (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{3}}$

3 **Join from column (A) to column (B) :**

(A)	(B)
1 The slope of the straight line which is parallel to X-axis is	• 10
2 $\sin^2 30° + \cos^2 30° =$	• 0
3 If ABCD is a rectangle where A (– 1 , – 4) , C (5 , 4) , then the length of $\overline{BD}$ = ... length units.	• 1
4 The equation of the straight line which passes through the origin point and its slope is 2 is y = ... X	• – 3
5 The equation of the straight line which passes through the point (2 , – 3) and parallel to X-axis is y = ...	• 2
6 The value of : $\frac{2 \tan 30°}{1 + \tan^2 30°}$ = ...	• $\frac{\sqrt{3}}{2}$

4 **Complete the following :**

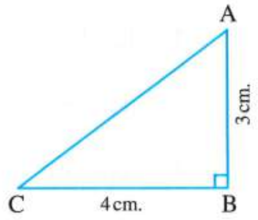
1 If $\overline{AB} // \overline{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{1}{2}$, then the slope of $\overleftrightarrow{CD}$ = ...

2 **In the opposite figure :**

ABC is a right-angled triangle at B

, AB = 3 cm. and BC = 4 cm.

, then sin C = ...



3 If the point (0 , a) belongs to the straight line : $3X - 4y = -12$, then a = ...

4 If $X \cos 60° = \tan 45°$, then X = ...

5 The distance between the point (4 , 3) and the origin point in the coordinates plane is ....

6 If the origin point is the midpoint of $\overline{AB}$ where A (5 , – 2)

, then B (............ , ...)

Governorates' Examinations on Trigonometry and Geometry

1 Cairo Governorate

Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer from those given :

1 If $\sin X = \frac{1}{2}$, where X is the measure of an acute angle , then $X =$ ....°

(a) 30 (b) 45 (c) 60 (d) 90

2 The straight line whose equation is $y = 3X + 4$ intercepts from the positive part of y-axis a part of length .... length units.

(a) 3 (b) 4 (c) 5 (d) 7

3 The measure of the exterior angle of an equilateral triangle equals ....°

(a) 120 (b) 90 (c) 60 (d) 30

4 If $\Delta ABC \equiv \Delta XYZ$, then AB = ...

(a) BC (b) YZ (c) XZ (d) XY

5 The equation of the straight line whose slope equals 1 and passes through the origin point is ....

(a) $y = X + 1$ (b) $X = 1$ (c) $y = 1$ (d) $y = X$

6 The angle whose measure is 30° supplements an angle of measure ....°

(a) 60 (b) 120 (c) 150 (d) 180

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2 [a] Without using calculator , prove that :

$4 \sin 45° \cos 45° = 2$ (showing the steps of the solution).

[b] Find the equation of the straight line which passes through the point (1 , 2) and is parallel to the straight line whose equation is $y = 3X + 5$

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3 [a] Find the value of X which satisfies that :

$X \sin 30° = \sin 30° \cos 60° + \cos 30° \sin 60°$

[b] Prove that the straight line which passes through the points (0 , 5) , (3 , 2) is perpendicular to the straight line which makes an angle of measure 45° with the positive direction of X-axis.

4 **[a]** ABCD is a parallelogram , M is the point of intersection of its diagonals where , A (3 , – 1) , C (1 , 7) Find the coordinates of the point M

[b] If A (2 , 8) , B (– 1 , 4) and C (3 , 1) are the vertices of the triangle ABC

, prove that : 1 The triangle ABC is a right-angled triangle at B

2 The triangle ABC is an isosceles triangle.

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5 **[a]** The triangle ABC is a right-angled triangle at B where AB = 7 cm. and BC = 24 cm.

Find the value of : 1 3 tan A × tan C 2 $\sin^2 A + \sin^2 C$

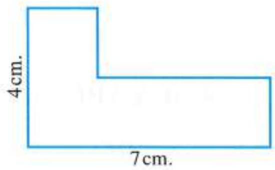
[b] If the points (0 , 1) , (a , 3) and (2 , 5) are collinear , find the value of a

2 Giza Governorate

Answer the following questions :

1 **Choose the correct answer :**

1 The perimeter of the opposite figure equals .... cm.



(a) 44 (b) 22

(c) 18 (d) 11

2 If ∠ X , ∠ Y are two complementary angles and sin X = $\frac{3}{5}$, then cos Y = ...

(a) $\frac{4}{5}$ (b) $\frac{3}{5}$ (c) $\frac{3}{4}$ (d) $\frac{5}{3}$

3 ABCD is a parallelogram and m (∠ A) : m (∠ B) = 1 : 2 , then m (∠ B) = ...°

(a) 45 (b) 135 (c) 120 (d) 115

4 The straight line whose equation is : $y - 2X - 5 = 0$ cuts from the positive part of y-axis a part of length .... length units.

(a) 2 (b) 5 (c) 7 (d) 10

5 In Δ ABC , if the angles ∠ A , ∠ B are complementary , then m (∠ C) = ... °

(a) 45 (b) 30 (c) 90 (d) 60

6 The slope of the straight line which makes with the positive direction of X-axis an angle whose positive measure is $X°$ equals ....

(a) $\sin X$ (b) $\cos X$ (c) $\frac{\sin X}{\cos X}$ (d) $\sin X + \cos X$

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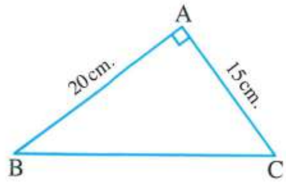
2 **[a]** ABCD is a trapezoid in which $\overline{AD} \parallel \overline{BC}$, m (∠ B) = 90° If AB = 3 cm. , AD = 6 cm. , BC = 10 cm. , **then prove that :** cos (∠ DCB) – tan (∠ ACB) = $\frac{1}{2}$

[b] If the straight line L_1 passes through the points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of X-axis an angle of measure 45° , then find the value of k which makes the two straight lines L_1 , L_2 parallel.

3 **[a] In the opposite figure :**



ABC is a triangle , m (∠ A) = 90° , AC = 15 cm.

, AB = 20 cm.

Prove that : cos C cos B – sin C sin B = 0

[b] ABCD is a parallelogram its diagonals intersect at M where :

A (3 , – 1) , B (6 , 2) , C (1 , 7)

Find the coordinates of the two points M and D

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4 **[a] Without using calculator , find m (∠ X) which satisfies the equation :**

tan X = 4 sin 30° cos 60° where X is a positive acute angle.

[b] Find the equation of the straight line passing through the point (3 , 4) and perpendicular to the straight line $5X - 2y + 7 = 0$

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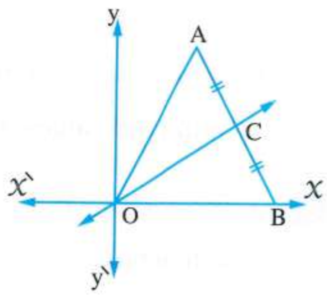
5 **[a]** If the distance between the point (a , 7) and the point (0 , 3) is equal to 5 length units , then find the value of a

[b] In the opposite figure :



AOB is an equilateral triangle

, C is the midpoint of $\overline{AB}$

Find the equation of $\overleftrightarrow{OC}$ where O is the origin point.

3 Alexandria Governorate

Answer the following questions : ***(Calculators are permitted)***

1 **Choose the correct answer from those given :**

1. If C (6 , – 4) is the midpoint of $\overline{AB}$ where A (5 , – 3) , then B is ....
   (a) (7 , – 5) (b) (– 5 , – 7) (c) (– 5 , 7) (d) (11 , – 7)
2. The measure of the angle that complements an angle of measure 60° is ....°
   (a) 120 (b) zero (c) 30 (d) 90
3. If sin θ = 0.6 , then m (∠ θ) ≃ ....
   (a) $51^\circ\ 33'\ 35''$ (b) $36^\circ\ 52'\ 12''$ (c) $47^\circ\ 15'\ 48''$ (d) $45^\circ\ 15'\ 6''$

4 The square whose area is 100 cm^2, then its diagonal length is .... cm.

(a) 10 (b) 50 (c) $2\sqrt{10}$ (d) $10\sqrt{2}$

5 ABC is a right-angled triangle at B where A (1 , 4) , B (– 1 , – 2)

, then the slope of $\overleftrightarrow{BC}$ equals ....

(a) $-\frac{1}{3}$ (b) 3 (c) $\frac{1}{3}$ (d) – 3

6 The sum of the lengths of any two sides of a triangle is .... the length of the third side.

(a) smaller than (b) equal to (c) greater than (d) twice

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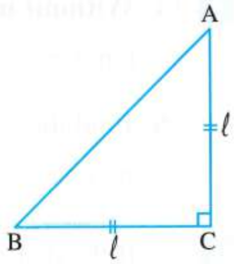
2 [a] **In the opposite figure :**

ABC is an isosceles triangle and right-angled at C

and the length of each of its legs is ℓ

Find : 1 The ratio among the lengths of the triangle sides AC : BC : AB

2 tan B , sin A



[b] If the distance between the two points (X , 5) , (6 , 1) equals $2\sqrt{5}$ length units , find the values of X

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3 [a] If the points A (3 , 2) , B (4 , – 3) , C (– 1 , – 2) , D (– 2 , 3) are the vertices of a rhombus

, find : 1 The coordinates of the intersection point of its diagonals.

2 The area of the rhombus ABCD

[b] **Without using calculator , find the value of X (where X is the measure of an acute angle) which satisfies :** $2 \sin X = \sin 30° \cos 60° + \cos 30° \sin 60°$

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4 [a] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line passing through the two points A (2 , – 3) , B (5 , – 4)

[b] **Prove the following equality with indicating the steps :** $\tan 60° = \frac{2 \tan 30°}{1 - \tan^2 30°}$

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5 [a] If the straight line L_1 passes through the two points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the X-axis an angle of measure 45° , find the value of k , if $L_1 // L_2$

[b] Prove that the points A (– 2 , 5) , B (3 , 3) , C (– 4 , 2) are not collinear.

4 El-Kalyoubia Governorate

Answer the following questions :

1 **Choose the correct answer :**

1 If $\cos X = \frac{\sqrt{2}}{2}$ where X is the measure of an acute angle , then $\sin 2X =$ ....

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{-\sqrt{2}}{2}$ (c) 1 (d) $\frac{2}{\sqrt{2}}$

2 The number of the axes of symmetry of the circle equals ....

(a) zero (b) 1 (c) 2 (d) an infinite number.

3 If ABCD is a rectangle , A $(-4 , -1)$, C $(4 , 5)$, then the length of $\overline{BD}$ = ... length units.

(a) 10 (b) 6 (c) 5 (d) 4

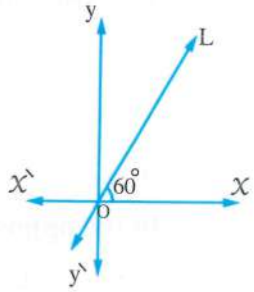
4 The perpendicular length between $X = 5$, $X + 3 = 0$ equals .... length units.

(a) 2 (b) 8 (c) -8 (d) 5

5 Δ ABC is an isosceles triangle and right-angled at C and the length of each leg is ℓ , then AB : BC : CA = ...

(a) $1 : 1 : \sqrt{2}$ (b) $1 : \sqrt{2} : 1$ (c) $\sqrt{2} : 1 : 2$ (d) $\sqrt{2} : 1 : 1$

6 **In the opposite figure :**



The equation of the straight line L is ....

(a) $X = \sqrt{3}\, y$ (b) $y = \sqrt{3}\, X$

(c) $X = y$ (d) $y = \sqrt{3}$

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2 **[a]** Find the slope and the length of the y-intercept for the straight line : $\frac{X}{2} + \frac{y}{3} = 1$

[b] If $\sin X = \tan 30° \sin 60°$ where X is the measure of an acute angle , **find :** $4 \cos X \sin X$

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3 **[a]** Find the equation of the straight line which passes through the point $(2 , -5)$ and is parallel to the straight line which passes through the two points $(-2 , 1)$, $(2 , 7)$

[b] ABC is a right-angled triangle at B , if $2\,AB = \sqrt{3}\,AC$

, **find :** 1 m (∠ C) 2 $\sin^2 A - \cos^2 C$

4 [a] If the two straight lines $L_1 : 3x - 4y - 3 = 0$, $L_2 : ay + 4x - 8 = 0$ are perpendicular , find the value of a

[b] If the points A (3 , 2) , B (4 , – 3) , C (– 1 , – 2) , D (– 2 , 3) are the vertices of a rhombus , find the area of the rhombus ABCD

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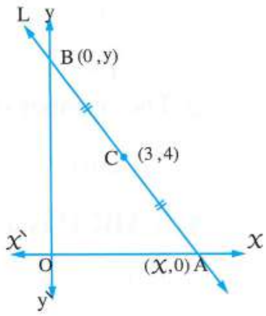
5 [a] **Prove that :** $\cos^2 60° = \cos^2 30° \tan^2 30° \tan 45°$

[b] **In the opposite figure :**

The point C is the midpoint of $\overline{AB}$ where C (3 , 4)

Find the perimeter of the triangle AOB



5 El-Sharkia Governorate

Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1 In Δ ABC , if m (∠ B) = 90° , then sin A + cos C = ...

(a) 2 sin C (b) 2 cos A (c) 2 cos C (d) tan A

2 If $\sin 2x = \frac{1}{2}$ where $2x$ is the measure of an acute angle , then x = ...°

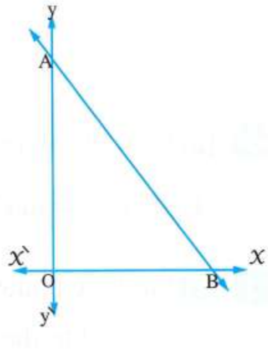
(a) 15 (b) 60 (c) 70 (d) 30

3 **In the opposite figure :**

If AO = 8 length units

, OB = 6 length units

, then the equation of $\overleftrightarrow{AB}$ is ....



(a) $y = \frac{4}{3}x + 8$ (b) $y = -\frac{4}{3}x - 8$

(c) $y = \frac{3}{4}x - 8$ (d) $y = -\frac{4}{3}x + 8$

4 The perpendicular distance between the point (3 , – 4) and x-axis equals .... length units.

(a) 3 (b) – 4 (c) 5 (d) 4

5 In the square XYZL , if the slope of $\overleftrightarrow{XZ} = 1$, then the slope of $\overleftrightarrow{YL} =$ ....

(a) 1 (b) -1 (c) ± 1 (d) $45°$

6 ABC is a right-angled triangle at B , where $3\ AC = 5\ BC$, then $\tan A =$ ....

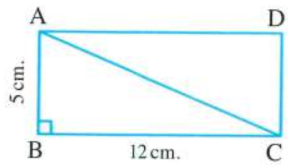
(a) $\frac{3}{5}$ (b) $\frac{5}{3}$ (c) $\frac{3}{4}$ (d) $\frac{4}{3}$

2 [a] If the point C $(4 , y)$ is the midpoint of $\overline{AB}$ where A $(x , 3)$ and B $(6 , 5)$

, find the value of : $x + y$

[b] Prove that the points A $(5 , 3)$, B $(3 , -2)$, C $(-2 , -4)$ are the vertices of a triangle , then prove that the triangle is an obtuse-angled triangle at B

3 [a] **In the opposite figure :**



If ABCD is a rectangle in which AB = 5 cm. , BC = 12 cm.

, find : 1 The length of $\overline{AC}$

2 The value of : $5 \tan (\angle ACD) - 13 \sin (\angle DAC)$

[b] If the two points A $(3 , -1)$, B $(5 , 3)$

, find the equation of the axis of symmetry of $\overline{AB}$

4 [a] **Without using the calculator , find the value of :** $\frac{\cos^2 60° + \cos^2 30°}{\sin 60° \tan 60°}$

[b] If the two equations of the two straight lines L_1 and L_2 are :

$L_1 : 6x + k y - 3 =$ zero and $L_2 : 3y = 2x + 6$ respectively.

, find the value of k which makes :

1 The two straight lines parallel. 2 The two straight lines perpendicular.

5 [a] Find the equation of the straight line which passes through the point $(1 , 4)$ and is parallel to the straight line : $x + 2y - 4 =$ zero

[b] If ABCD is a square where : A $(2 , 4)$, B $(-3 ,$ zero$)$, C $(-7 , 5)$

, find : 1 The coordinates of the point D 2 The area of the square ABCD

6 El-Monofia Governorate

Answer the following questions : *(Using calculator is permitted)*

1 Choose the correct answer :

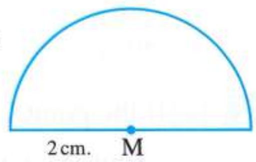
1 The surface area of a square is $25\ cm^2$, then the length of its diagonal is .... cm.

(a) 5 (b) 10 (c) $5\sqrt{2}$ (d) $10\sqrt{2}$

2 ABC is a triangle. If $(AC)^2 > (AB)^2 + (BC)^2$, then $\angle$ C is ....

(a) acute. (b) obtuse. (c) right. (d) straight.

3 The opposite figure represents a semicircle with the radius length of its circle is 2 cm. , then the perimeter of this figure = ... cm.



(a) 2π (b) 4π

(c) $2\pi + 4$ (d) $4\pi + 2$

4 If $\cos \frac{X}{2} = \frac{\sqrt{3}}{2}$ where $\frac{X}{2}$ is the measure of an acute angle , then $\tan(X - 15°) =$ ....

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) 1 (d) $\frac{\sqrt{3}}{2}$

5 The equation of a straight line is : $\frac{X}{2} - \frac{y}{3} = 6$, then it intercepts from X-axis a part of length .... length units.

(a) 3 (b) 12 (c) 6 (d) 18

6 If $\frac{-2}{3}$, $\frac{6}{k}$ are the slopes of two perpendicular straight lines , then k = ...

(a) 4 (b) -9 (c) -4 (d) 9

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2 [a] Determine the type of the triangle ABC where : A (3 , 0) , B (1 , 4) and C (– 1 , 2) with respect to the lengths of its sides.

[b] **Without using calculator , prove that :** $\frac{\tan 45° + \tan 30°}{1 - \tan 45° \tan 30°} = 2 + \sqrt{3}$

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3 [a] ABCD is a quadrilateral where A (2 , 4) , B (– 3 , 0) , C (– 7 , 5) and D (– 2 , 9)

Prove that : ABCD is a square.

[b] ABC is a right-angled triangle at C , AC = 6 cm. and BC = 8 cm.

Find the value of : cos A cos B – sin A sin B

---

4 [a] Prove that the straight line which passes through the two points (– 3 , – 2) and B (4 , 5) is parallel to the straight line which makes with the positive direction of X-axis an angle its measure is 45°

[b] If $\sqrt{3} \sin X \tan 30° = \tan 45° \cos 2X$, find the value of X (where X is the measure of an acute angle).

---

5 [a] Find the equation of the straight line which is perpendicular to the straight line :

$3X - 4y + 7 = 0$ and intercepts from the positive part of y-axis a part of length 4 units.

[b] ABCD is a rectangle in which AB = 3 cm. , AC = 5 cm.

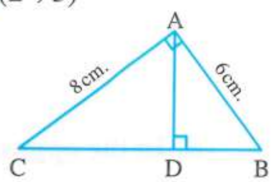
Find : 1 m ($\angle$ ACB) 2 The area of the rectangle ABCD

7 El-Gharbia Governorate

Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer :

1. The number of the axes of symmetry of the scalene triangle equals ....
   (a) zero (b) 1 (c) 2 (d) 3
2. In the triangle XYZ , if $(YZ)^2 + (XZ)^2 < (XY)^2$, then $\angle$ Z is ....
   (a) acute. (b) right. (c) obtuse. (d) straight.
3. If the distance between the two points (a , 0) and (0 , 1) is one length unit , then a = ...
   (a) 1 (b) – 1 (c) 0 (d) 2
4. If the origin point is the midpoint of $\overline{AB}$ where A (2 , – 3) , then the point B is ....
   (a) (– 3 , 2) (b) (– 2 , 3) (c) (– 2 , – 3) (d) (2 , 3)
5. **In the opposite figure :** ABC is a right-angled triangle at A in which $\overrightarrow{AD} \perp \overline{BC}$ cutting it at D , AB = 6 cm. and AC = 8 cm. , then AD = ... cm.



   (a) 3.6 (b) 8.4 (c) 4.8 (d) 6.4
6. ABC is a right-angled triangle at B , then sin A + 2 cos C = ...
   (a) 2 sin C (b) 3 sin A (c) 2 sin A (d) 3 cos A

---

2 **[a]** XYZ is a right-angled triangle at Y in which : XY = 5 cm. and XZ = 13 cm.
Find the value of : cos X cos Z – sin X sin Z

[b] Find the measure of the positive angle that $\overleftrightarrow{AB}$ makes where :
A (3 , – 2) , B (6 , 1) with the negative direction of the x-axis.

---

3 **[a] Find the value of x if :** $\cos(3x + 6°) = \frac{1}{2}$ where $(3x + 6°)$ is the measure of an acute angle.

[b] Find the equation of the straight line which is parallel to the straight line $\frac{y-1}{x} = \frac{1}{3}$ and intersects from the negative part of y-axis a part equals 3 length units.

---

4 **[a] Find the value of x which satisfies :** $x - \sin 30° \cos^2 45° = \sin^2 60°$

[b] If the points A (– 3 , 0) , B (3 , 4) and C (1 , – 6) are the vertices of an isosceles triangle of vertex A , find the length of the drawn line segment from A perpendicular to $\overline{BC}$

5 [a] If the point M (– 1 , 2) is the centre of the circle passing through the point A (3 , – 1) , find the circumference of the circle $\left(\text{where } \pi = \frac{22}{7}\right)$

[b] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line passing through the two points A (2 , – 3) and B (5 , – 4)

8 El-Dakahlia Governorate

Answer the following questions : *(Calculator is permitted)*

1 [a] **Choose the correct answer :**

1 If m (∠ A) = 75° , sin A = cos B , ∠ B is acute , then m (∠ B) = ...

(a) 45° (b) 75° (c) 15° (d) 105°

2 If ABC is a right-angled triangle at B , AB = BC , then tan A = ...

(a) $\frac{1}{3}$ (b) $\sqrt{3}$ (c) 1 (d) $\frac{1}{\sqrt{2}}$

3 If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = 0$, then the slope of $\overleftrightarrow{CD}$ = ...

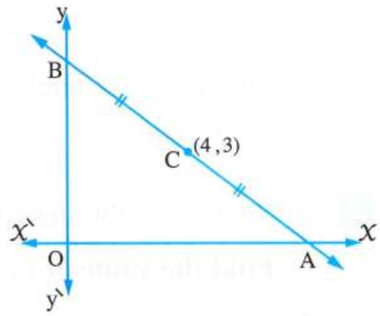
(a) 1 (b) – 1 (c) zero (d) not defined.

[b] **In the opposite figure :**

The point C is the midpoint of $\overline{AB}$ where C (4 , 3) , O is the origin point in the perpendicular coordinates system.

Find : 1 The coordinates of the two points A , B

2 The area of the triangle AOB



2 [a] **Choose the correct answer :**

1 If cos 3 $X = \frac{1}{2}$, 3 X is the measure of an acute angle , then X = ...

(a) 20° (b) 30° (c) 45° (d) 60°

2 The radius length of the circle whose centre is (0 , 0) and passes through (3 , 4) equals .... length units.

(a) 7 (b) 1 (c) 12 (d) 5

3 The measure of the exterior angle of the equilateral triangle equals ....

(a) 60° (b) 90° (c) 120° (d) 80°

[b] **Without using calculator , find the value of X which satisfies :**

$2 \sin X = \tan^2 60° - 2 \tan 45°$ where X is the measure of an acute angle.

3 **[a]** Find the equation of the straight line which intercepts from the positive parts of the two axes two parts of lengths 2 units , 3 units from X and y-axes respectively.

[b] ABC is a right-angled triangle at C , AC = 5 cm. , BC = 12 cm. **Find the value of :** cos A cos B – sin A sin B

---

4 **[a]** ABCD is a parallelogram where A (3 , 2) , B (4 , – 5) , C (0 , – 3)

Find the coordinates of the point at which the two diagonals intersect , then find the coordinates of the point D

[b] **Without using calculator , prove that :** $2 \sin 30° + 4 \cos 60° = \tan^2 60°$

---

5 **[a]** Prove that A (5 , 1) , B (3 , – 7) , C (1 , 3) are not collinear points.

[b] Find the equation of the straight line perpendicular to $\overline{AB}$ from its midpoint where A (2 , 1) , B (4 , 5)

9 Ismailia Governorate

Answer the following questions : (Calculator is allowed)

1 **Choose the correct answer from those given :**

1. The parallelogram whose two diagonals are equal in length and perpendicular is the ....
   (a) rectangle. (b) rhombus. (c) square. (d) trapezium.

2. If C is the midpoint of $\overline{AB}$ where A (– 3 , 6) , B (3 , – 6) , then C = ...
   (a) (6 , – 6) (b) (0 , 0) (c) (3 , 3) (d) (– 3 , 0)

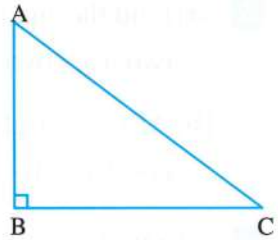
3. The number of diagonals of the triangle equals ....
   (a) 3 (b) 2 (c) 1 (d) 0

4. ABC is a triangle in which m (∠ A) = 75° , sin B = cos B , then m (∠ C) = ... °
   (a) 90 (b) 60 (c) 45 (d) 30

5. If the ratio between the measures of two adjacent supplementary angles is 1 : 2 , then the measure of the greater angle equals ....°
   (a) 120 (b) 90 (c) 180 (d) 60

6. The equation of the straight line which passes through the origin point and its slope = 3 is ....
   (a) y = X (b) y = 3 (c) X = 3 (d) y = 3 X

2 **[a] In the opposite figure :**



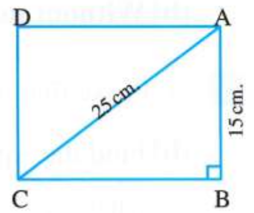
ABC is a right-angled triangle at B

Prove that : $\sin^2 A + \sin^2 C = 1$

[b] Prove that the straight line which passes through the two points $(-1, 3)$, $(2, 4)$ is parallel to the straight line whose equation is $3y - x - 1 = 0$

---

3 **[a] In the opposite figure :**



ABCD is a rectangle , AB = 15 cm. , AC = 25 cm.

Find : m ($\angle$ ACB) in degree measure

, then find the area of the rectangle ABCD

[b] The opposite table shows a linear relation.

x	1	2	3
y	1	3	5

Find : **1** The equation of the straight line.

2 The length of the intercepted part from y-axis.

---

4 **[a]** Prove that the quadrilateral ABCD whose vertices are

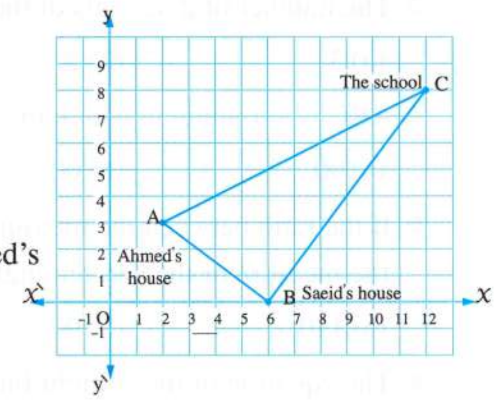
A $(-1, 3)$, B $(5, 1)$, C $(7, 4)$ and D $(1, 6)$ is a parallelogram.

[b] Find the slope of the straight line which intersects from the positive parts of two coordinates x-axis and y-axis two parts of lengths 3 units , 4 units respectively , then find the equation of this straight line.

---

5 **[a] Without using calculator , find the value of :** $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$

[b] In the opposite figure :



A represents the location of Ahmed's house

, B represents the location of Saeid's house

, C represents the location of the School.

1 Which is nearer (closer) to the school : Ahmed's house or Saeid's house ? Why ? Without measuring.

2 Are the two roads $\overline{AB}$ and $\overline{BC}$ perpendicular ? giving reason , without measuring.

10 Suez Governorate

Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1. If $\sin 30° = \cos \theta$ where θ is an acute angle , then $m(\angle \theta) =$ ....°
   (a) 15 (b) 30 (c) 60 (d) 90
2. ABC is a triangle in which : $(AB)^2 > (BC)^2 + (AC)^2$, then $\angle C$ is ....
   (a) acute. (b) obtuse. (c) right. (d) reflex.
3. If A (– 2 , 5) , B (2 , – 5) , then the midpoint of $\overline{AB}$ is ....
   (a) (0 , 0) (b) (2 , 5) (c) (5 , 2) (d) (– 5 , – 2)
4. If $\overleftrightarrow{XY}$ is the axis of symmetry of $\overline{AB}$, then XA .... XB
   (a) > (b) < (c) = (d) ≤
5. If m_1 , m_2 are the slopes of two perpendicular straight lines , then $m_1 \times m_2 =$ ....
   (a) – 1 (b) zero (c) 1 (d) 2
6. The surface area of the rhombus ABCD = ...
   (a) $\frac{1}{2}$ AB × DC (b) $\frac{1}{2}$ AC × BD (c) $\frac{1}{2}$ AB × AD (d) $\frac{1}{2}$ AD × BC

2 [a] Find the equation of the straight line whose slope is 2 and intersects from the positive part of the y-axis a part equals 7 units.

[b] **Find the value of X if :** $4X = \cos^2 30° \tan^2 30° \tan^2 45°$

3 [a] ABCD is a parallelogram whose diagonals intersect at E
If A (4 , 3) , B (0 , 2) , C (– 2 , – 3) , then find the coordinates of E , D

[b] **Without using calculator , prove that :**

$\tan^2 60° - \tan^2 45° = \sin^2 60° + \cos^2 60° + 2 \sin 30°$

4 [a] Prove that the straight line passing through the two points (2 , – 1) , (6 , 3) is parallel to the straight line that makes with the positive direction of the X-axis an angle of measure 45°

[b] ABC is a right-angled triangle at B , if $2 AB = \sqrt{3} AC$
, **find :** sin C , tan A

5 [a] Prove that the points A (– 3 , 0) , B (3 , 4) , C (1 , – 6) are the vertices of an isosceles triangle of vertex A

[b] Find the equation of the straight line which passes through the point (3 , 5) and is perpendicular to the straight line whose slope equals $\frac{-1}{2}$

11 Port Said Governorate

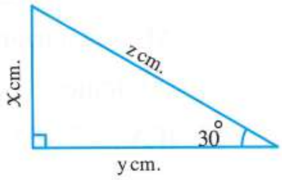
Answer the following questions :

1 Choose the correct answer from those given :

1 The product of multiplying the slopes of two perpendicular straight lines equals ....

(a) 1 (b) -1 (c) ± 1 (d) zero

2 **In the opposite figure :**



(a) $x + y = \frac{1}{2}z$ (b) $z = x^2 + y^2$

(c) $x = \frac{1}{2}z$ (d) $2y = z$

3 $\sin 30° = \cos$ ....

(a) 10° (b) 45° (c) 30° (d) 60°

4 $\tan 45° =$ ....

(a) 1 (b) $2\sqrt{2}$ (c) $\frac{1}{2}$ (d) $\sqrt{2}$

5 If A (5 , 7) , B (1 , – 1) , then the midpoint of $\overline{AB}$ is ....

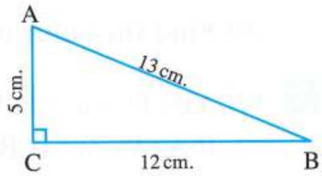
(a) (2 , 3) (b) (3 , 3) (c) (3 , 2) (d) (3 , 4)

6 If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{2}{3}$, then the slope of $\overleftrightarrow{CD} =$ ....

(a) $\frac{3}{2}$ (b) $\frac{-3}{2}$ (c) $\frac{-2}{3}$ (d) $\frac{2}{3}$

---

2 [a] In the opposite figure :



ABC is a right-angled triangle at C

, AB = 13 cm. , BC = 12 cm. , AC = 5 cm.

1 **Prove that :** $\sin A \cos B + \cos A \sin B = 1$

2 **Find :** $1 + \tan^2 A$

[b] Find the value of the following : $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$

---

3 [a] Find m ($\angle$ E) , where $\angle$ E is an acute angle : $\sin E = \sin 60° \cos 30° - \cos 60° \sin 30°$

[b] Prove that the straight line passing through the two points (– 3 , – 2) , (4 , 5) is parallel to the straight line that makes with the positive direction of the x-axis an angle of measure 45°

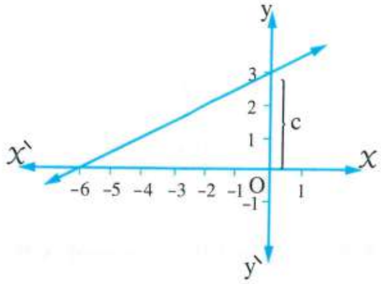
---

4 [a] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line passing through the two points A (2 , – 3) , B (5 , – 4)

[b] Prove that the points A (3 , – 1) , B (– 4 , 6) and C (2 , – 2) are located on the circle whose centre is the point M (– 1 , 2)

5 [a] ABCD is a parallelogram where A (3 , 2) , B (4 , – 5) , C (0 , – 3) , find the coordinates of the point at which the two diagonals intersect , then find the coordinates of the point D

[b] **Using the opposite figure , find the following :**



1 The length of the y-intercept (c)

2 The length of the X-intercept.

3 The slope of the straight line (m)

12 Damietta Governorate

Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from the given answers :**

1 If the lengths of two sides of an isosceles triangle are 2 cm. and 5 cm. , then the length of the third side is .... cm.

(a) 2 (b) 3 (c) 5 (d) 7

2 If $\sin X = \frac{1}{2}$, X is the measure of an acute angle , then $\sin 2X =$ ....

(a) $\frac{\sqrt{3}}{3}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{\sqrt{2}}{2}$ (d) 1

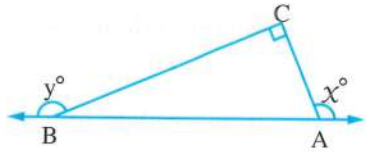
3 The surface area of the square is equal to the square of the length of the diagonal divided by ....

(a) 1 (b) 2 (c) 3 (d) 4

4 The equation of the straight line which passes through the point (– 2 , 5) and is parallel to X-axis is ....

(a) $X = -2$ (b) $X = 5$ (c) $y = -2$ (d) $y = 5$

5 **In the opposite figure :**



$A \in \overleftrightarrow{AB}$, $B \in \overleftrightarrow{AB}$, m ($\angle$ C) = 90°

, then $X + y =$ ....

(a) 90° (b) 180° (c) 270° (d) 360°

6 If $\overleftrightarrow{AB}$, $\overleftrightarrow{DC}$ are parallel , their slopes are m_1 , m_2 , then ....

(a) $m_1 = -m_2$ (b) $m_1 - m_2 = 0$ (c) $m_1 m_2 = -1$ (d) $m_1 m_2 = 1$

2 [a] ABC is a right-angled triangle at C , AC = 6 cm. , BC = 8 cm.

Find : cos A cos B – sin A sin B

[b] Find the equation of the straight line which intercepts from the positive parts of the two axes two parts of lengths 3 units and 2 units for X and y axes respectively and find its slope.

---

3 **[a]** If the distance of the point $(X , 5)$ from the point $(6 , 1)$ equals $2\sqrt{5}$ length units , then find the value of X

[b] Find the equation of the straight line which passes through the points $(2 , -1)$, $(1 , 1)$ and if the point $(0 , k) \in$ the straight line , find the value of k

---

4 **[a]** **Find the value of X if :** $4X = \cos^2 30° \tan^2 30° \tan^2 45°$ (Indicating the steps of the solution)

[b] If the straight line passing through the two points $(a , 0)$, $(0 , 3)$ is perpendicular to the straight line that makes an angle of measure 30° with the positive direction of the X-axis find a.

---

5 **[a]** **Prove that :** $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30° = 0$ (Indicating the steps of the solution)

[b] Find the equation of the straight line perpendicular to $\overline{AB}$ from its midpoint C where A (1 , 3) and B (3 , 5)

13 Kafr El-Sheikh Governorate

Answer the following questions : ***(Calculators are permitted)***

1 **Choose the correct answer from those given :**

1. In Δ ABC , if m ($\angle$ A) = 60° , sin B = cos B , then m ($\angle$ C) = ...

(a) 30° (b) 75° (c) 90° (d) 105°

2. The area of the triangle bounded by the straight lines : $X = 0$, $y = 0$, $5X + 2y = 10$ is .... square units.

(a) 10 (b) 8 (c) 7 (d) 5

3. If the straight line passing through the two points $(\sqrt{3} , 1)$, $(2\sqrt{3} , y)$ its slope equals tan 60° , then y = ...

(a) 2 (b) 3 (c) 4 (d) 5

4. If the straight line $aX + (2 - a)y = 5$ is parallel to the straight line passing through the two points (1 , 4) , (3 , 5) , then a = ...

(a) 3 (b) – 2 (c) 1 (d) zero

5. If the point $(\ell - 3 , 2)$ is in the first quadrant , then ℓ can be equal to ....

(a) – 3 (b) 2 (c) 7 (d) zero

6. The complement of the angle whose measure is 65° is of measure ....

(a) 35° (b) 25° (c) 115° (d) 45°

2 **[a]** ABC is a right-angled triangle at B , AC = 13 cm. , BC = 12 cm.

Prove that : $\sin^2 C + \sin^2 A = 1$

[b] If the point A (5 , 2) lies on the circle of centre M (1 , – 1) , **then find :**

1 The surface area of the circle in terms of π

2 The equation of the straight line which passes through A and M

---

3 **[a]** If A (– 3 , 5) , B (– 1 , 7) , find the equation of the axis of symmetry of $\overline{AB}$

[b] Without using the calculator , prove that :

$\tan^2 60° - \tan^2 45° = \sin^2 60° + \cos^2 60° + 2 \sin 30°$

---

4 **[a]** Prove that the points A (– 1 , 3) , B (5 , 1) , C (7 , 4) , D (1 , 6) are the vertices of the parallelogram ABCD

[b] ABCD is an isosceles trapezoid in which $\overline{AD} \mathbin{//} \overline{BC}$, AD = 4 cm. , AB = 5 cm.

, BC = 12 cm. , **then calculate :** $\dfrac{\tan B \cos C}{\cos^2 C + \sin^2 C}$

---

5 **[a]** If the straight line L_1 passes through the two points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of X-axis an angle of measure 45°

, find the value of k if : 1 $L_1 \mathbin{//} L_2$ 2 $L_1 \perp L_2$

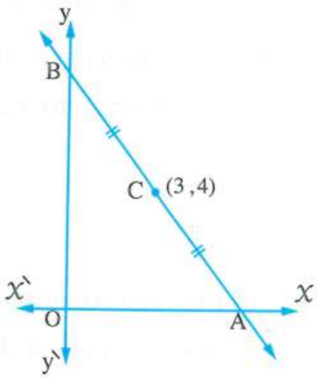
[b] In the opposite figure :

The point C is the midpoint of $\overline{AB}$

where C (3 , 4) , O is the origin point of the perpendicular coordinates system.

Find : 1 The coordinates of the two points A and B

2 The equation of $\overleftrightarrow{AB}$



14 El-Beheira Governorate

Answer the following questions : ***(Calculator is permitted)***

1 **Choose the correct answer from the given ones :**

1 If A (5 , 7) and B (1 , – 1) , then the midpoint of $\overline{AB}$ is ....

(a) (2 , 3) (b) (3 , 3) (c) (3 , 2) (d) (3 , 4)

2 If m (∠ B) = 80° , then m (reflex ∠ B) = ...

(a) 10° (b) 100° (c) 80° (d) 280°

3 The slope of the straight line which is parallel to the straight line passing through the two points (2 , 3) , (– 2 , 4) equals ....

(a) – 1 (b) $\frac{-1}{4}$ (c) $\frac{1}{4}$ (d) 1

4 If $\tan (X + 10°) = \sqrt{3}$ where X is the measure of an acute angle , then $X =$ ....

(a) 30° (b) 45° (c) 50° (d) 60°

5 In a parallelogram , the two diagonals are ....

(a) perpendicular. (b) equal in length.

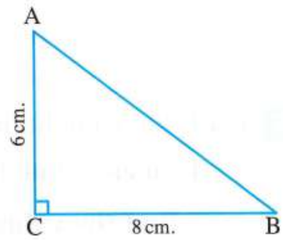
(c) equal in length and perpendicular. (d) bisecting each other.

6 The triangle whose sides lengths are 2 cm. , $(X + 2)$ cm. and 5 cm. becomes an isosceles triangle when $X =$ ....

(a) zero (b) 2 (c) 3 (d) 5

---

2 [a] **In the opposite figure :**



ABC is a right-angled triangle

at C , AC = 6 cm. , BC = 8 cm.

Find : 1 cos A cos B – sin A sin B

2 m (∠ B)

[b] State the kind of the triangle whose vertices are the points A (– 2 , 4) , B (3 , – 1) , C (4 , 5) with respect to its sides.

---

3 [a] **Without using the calculator , prove that :**

$\tan^2 60° - \tan^2 45° = \cos^2 30° + \cos^2 60° + 2 \sin 30°$

[b] Find the equation of the straight line whose slope equals 2 and intersects from the negative part of the y-axis a part equals 3 units and draw it.

---

4 [a] **Find the value of X which satisfies :** $X \sin 30° \cos^2 45° = \sin^2 60°$

[b] If the straight line L_1 passes through the two points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the X-axis an angle of measure 45° , find the value of k , if $L_1 \parallel L_2$

---

5 [a] If the point (3 , 1) is the midpoint of $\overline{AB}$ where A (1 , y) and B $(X , 3)$, find the point (X , y)

[b] Find the equation of the straight line passing through the point (3 , – 5) and perpendicular to the straight line : $X + 2y - 7 = 0$

15 El-Fayoum Governorate

Answer the following questions : *(Using calculators is allowed)*

1 **Choose the correct answer :**

1 If $\tan 3X = \sqrt{3}$ where X is the measure of an acute angle , then $X =$ ....°

(a) 10 (b) 15 (c) 20 (d) 30

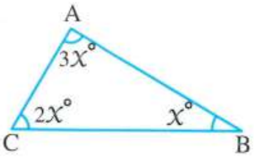
2 If the perimeter of a square is 16 cm. , then its area is .... cm^2.

(a) 4 (b) 16 (c) 60 (d) 90

3 The perpendicular distance between the two straight lines : $X - 2 = 0$, $X + 3 = 0$ equals .... length units.

(a) 1 (b) 5 (c) 2 (d) 3

4 **In the opposite figure :**



Δ ABC is .... triangle.

(a) an isosceles. (b) an equilateral.

(c) an obtuse-angled. (d) a right-angled.

5 The area of the triangle identified by the straight lines :

$3X - 4y = 12$, $X = 0$, $y = 0$ equals .... square units.

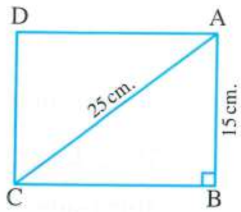
(a) 6 (b) 7 (c) 12 (d) 5

6 The measure of the angle of the regular hexagon is ....

(a) 108° (b) 90° (c) 120° (d) 60°

---

2 [a] **In the opposite figure :**



ABCD is a rectangle in which AB = 15 cm.

, AC = 25 cm.

Find : 1 m (∠ ACB)

2 The surface area of the rectangle ABCD

[b] If the distance between the two points (a , 7) , (– 2 , 3) equals 5 length units , find the values of a

---

3 [a] **Without using the calculator , find the value of X (where X is the measure of an acute angle) which satisfies :**

$2 \sin X = \sin 30° \cos 60° + \cos 30° \sin 60°$

[b] Prove that the straight line passing through the two points (– 1 , 3) , (2 , 4) is parallel to the straight line $3y - X - 1 = 0$

4 [a] ABCD is a quadrilateral , where A (5 , 3) , B (6 , – 2) , C (1 , – 1) , D (0 , 4).

Prove that : ABCD is a rhombus.

[b] If A (5 , – 6) , B (3 , 7) and C (1 , – 3) , find the equation of the straight line passing through the point A and the midpoint of $\overline{BC}$

---

5 [a] **Without using the calculator , prove that :**

$$\frac{\cos^2 60° + \cos^2 30° + \tan^2 45°}{\sin 60° \tan 60° - \sin 30°} = 2$$

[b] If the straight line L_1 passes through the two points A (3 , 1) , B (2 , y) and the straight line L_2 makes an angle whose measure is 45° with the positive direction of X-axis , then find the value of y if $L_1 \perp L_2$

16 Beni Suef Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer from those given :**

1 The product of multiplying the slopes of two perpendicular straight lines equals ....

(a) zero (b) 1 (c) – 1 (d) $\frac{1}{2}$

2 If $\overline{AB}$ is a diameter in a circle of centre M , where A (2 , 4) and B (– 2 , 0) , then M = ...

(a) (0 , 2) (b) (2 , 0) (c) (0 , 0) (d) (2 , 2)

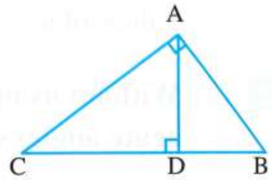
3 The quadrilateral whose diagonals are equal in length and perpendicular is the ....

(a) parallelogram. (b) rhombus. (c) rectangle. (d) square.

4 If the lengths of two sides of a triangle are 2 cm. and 5 cm. , then the length of the third side ∈ ....

(a)]2 , 5[(b)]3 , 7[(c)]2 , 7[(d)]3 , 5[

5 **In the opposite figure :**



If m (∠ BAC) = 90° , $\overline{AD} \perp \overline{BC}$, then $(AD)^2$ = ...

(a) AB × AC (b) DB × DC (c) BD × BC (d) $(AB)^2 + (BD)^2$

6 If tan (X + 15°) = 1 , where X is the measure of an acute angle , then X = ...

(a) 60° (b) 45° (c) 30° (d) 15°

2 [a] Find the area of the rectangle ABCD where A $(-1 , 3)$, B $(5 , 1)$, C $(6 , 4)$ and D $(0 , 6)$

[b] **Find the value of X if :** $X \cos 60° = \sin 30° + \tan 45°$

---

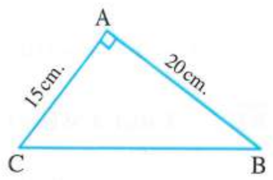
3 [a] Prove that the straight line passing through the two points $(-1 , 0)$ and $(3 , 4)$ is parallel to the straight line that makes a positive angle of measure 45° with the positive direction of the X-axis.

[b] **In the opposite figure :**

ABC is a right-angled triangle at A

, AB = 20 cm. and AC = 15 cm.

Prove that : $\cos C \cos B - \sin C \sin B = \text{zero}$



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4 [a] If C $(X , -3)$ is the midpoint of $\overline{AB}$ where A $(-3 , y)$, B $(9 , 11)$

, find the value of : $X + y$

[b] **Without using the calculator , find the value of the expression :**

$\sin 45° \cos 45° + 3 \sin 30° \cos 60° - \cos^2 30°$

---

5 [a] Find the equation of the straight line passing through the point $(2 , -5)$ and perpendicular to the straight line whose equation is $y - 2X + 7 = \text{zero}$

[b] Prove that the points A $(2 , 3)$, B $(6 , 2)$, C $(0 , -1)$ and D $(-2 , 1)$ are the vertices of a trapezoid.

17 El-Menia Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer :**

1 The measure of the exterior angle of the equilateral triangle equals ....

(a) 60° (b) 90° (c) 120° (d) 180°

2 If L_1 , L_2 are two lines parallel and their slopes are $\frac{-2}{3} , \frac{k}{6}$, then k = ...

(a) -12 (b) -9 (c) 4 (d) -4

3 The lengths of two sides of an isosceles triangle equal 2 cm. , 5 cm.

, then the length of the third side equals .... cm.

(a) 5 (b) 2 (c) 3 (d) 7

4 The distance between the point $(5 , 12)$ and the point of origin equals .... units.

(a) 5 (b) 13 (c) 12 (d) $\sqrt{17}$

5 The area of the square whose perimeter is 16 cm. equals .... cm^2

(a) 4 (b) 8 (c) 16 (d) 256

6 XYZ is an isosceles triangle right-angled at Z , then tan X = ...

(a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$ (c) 1 (d) $\frac{1}{3}$

---

2 [a] Prove that the triangle whose vertices are A (6 , 0) , B (2 , – 4) , C (– 4 , 2) is right-angled at B

[b] XYZ is a right-angled triangle at Z where X Z = 7 cm. **Find the value of :** tan X × tan Y

---

3 [a] **Find X where :** $4\,X = \cos^2 30° \tan^2 30° \tan^2 45°$

[b] Find the equation of the straight line passing through the point (3 , – 5) and parallel to the straight line $X + 2\,y - 7 = 0$

---

4 [a] ABCD is a parallelogram , A (– 2 , 5) , B (3 , 3) , C (– 4 , 2) Find the two coordinates of the point at which the two diagonals intersect , then find the coordinates of the point D.

[b] **Without using the calculator , prove that :** $\sin^2 30° = 5\cos^2 60° - \tan^2 45°$

---

5 [a] If the straight line L_1 passes through the two points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the X-axis an angle whose measure is 45° , then find k , if the two straight lines L_1 , L_2 are perpendicular.

[b] Find the equation of the straight line which intersects from the positive parts of X and y axes two parts of lengths 2 units , 3 units respectively.

18 Assiut Governorate

Answer the following questions : ***(Calculator is permitted)***

1 **Choose the correct answer :**

1 The sum of the measures of the interior angles of a triangle equals ....

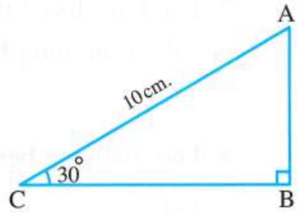
(a) 90° (b) 180° (c) 360° (d) 540°

2 **In the opposite figure :**

AB = ... cm.

(a) 5 (b) 15

(c) 20 (d) 40



3 The measure of the interior angle of a regular hexagon equals ....

(a) 108° (b) 120° (c) 90° (d) 180°

4 If $2 \sin X = 1$ (where X is the measure of an acute angle) , then $X =$ ....

(a) 45° (b) 90° (c) 30° (d) 60°

5 The equation of the straight line which passes through the point (2 , – 3) and is parallel to X-axis is ....

(a) $X = 2$ (b) $y = -3$ (c) $X = -2$ (d) $y = 3$

6 If the origin point is the midpoint of $\overline{AB}$, A (5 , – 2) , then B = ...

(a) (5 , 2) (b) (– 5 , – 2) (c) (– 5 , 2) (d) (0 , 0)

---

2 [a] Prove that the points A (– 3 , – 1) , B (6 , 5) and C (3 , 3) are collinear.

[b] **Find the value of X that satisfies :** $X \sin 30° \cos^2 45° = \sin^2 60°$

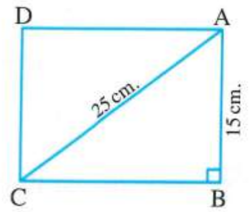
---

3 [a] If the triangle whose vertices are Y (4 , 2) , X (3 , 5) and Z (– 5 , a) is right-angled at Y , then find the value of a

[b] Find the equation of the straight line whose slope is 2 and intersects from the positive part of the y-axis a part that equals 7 units.

---

4 [a] **In the opposite figure :**



ABCD is a rectangle in which AB = 15 cm.

and AC = 25 cm.

Find : 1 m (∠ ACB)

2 The surface area of the rectangle ABCD

[b] Prove that the straight line which passes through the points (2 , 3) , (0 , 0) is parallel to the straight line which passes through (– 1 , 4) , (1 , 7)

---

5 [a] ABCD is a quadrilateral , where A (5 , 3) , B (6 , – 2) , C (1 , – 1) and D (0 , 4)

Prove that : ABCD is a rhombus.

[b] Find the slope and the intercepted part of y-axis by the straight line :

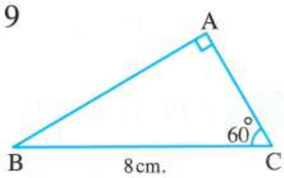
$2X - 3y - 6 = 0$

19 Souhag Governorate

Answer the following questions : ***(Calculator is permitted)***

1 Choose the correct answer :

1. If $\sin \frac{X}{2} = \frac{1}{2}$, X is the measure of an acute angle , then $X =$ ....°
   (a) 30 (b) 60 (c) 10 (d) 90
2. The perimeter of the square whose surface area is 100 cm.² equals .... cm.
   (a) 10 (b) 20 (c) 40 (d) 50
3. If $\frac{-2}{3}$, $\frac{6}{k}$ are the slopes of two perpendicular straight lines , then k = ...
   (a) 4 (b) – 9 (c) – 4 (d) 9
4. **In the opposite figure :**



   The length of $\overline{AC}$ = ... cm.
   (a) 2 (b) 6
   (c) 4 (d) 8
5. The equation of the straight line passing through the origin point and its slope = 1 is ....
   (a) $y = X$ (b) $y = -X$ (c) $y = 2X$ (d) $y = 0$
6. If the numbers 3 , 7 , ℓ are lengths of sides of a triangle , then ℓ can be equal to ....
   (a) 3 (b) 7 (c) 4 (d) 10

---

2 [a] If the midpoint of $\overline{BC}$ is A (2 , 3) and C (– 1 , 3) , find the point B

[b] If $\cos X = \sin 30° \cos 60°$, **find :**

1. The measure of $\angle X$ (where X is an acute angle)
2. $\tan X$

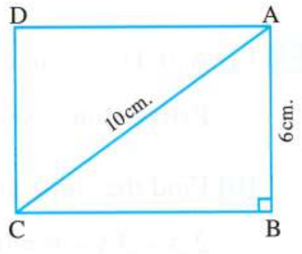
---

3 [a] If the straight line whose equation is : $a X + 2y - 7 = 0$ is parallel to the straight line which makes an angle of measure 45° with the positive direction of X-axis , find the value of a

[b] **Without using calculator , prove that :** $\tan^2 60° - \tan^2 45° = 4 \sin 30°$

---

4 [a] **In the opposite figure :**



ABCD is a rectangle where AB = 6 cm. , AC = 10 cm.

Find : 1. m (∠ ACB)

2. The surface area of the rectangle ABCD

[b] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line $X + 3y + 7 = 0$

---

5 [a] Prove that the points A (3 , – 1) , B (– 4 , 6) , C (2 , – 2) which belong to a perpendicular coordinates plane lie on the circle whose centre is the point M (– 1 , 2) , then find the area of the circle.

[b] Find the slope and the intercepted part of y-axis by the straight line where its equation is $4X + 5y - 10 = 0$

20 Qena Governorate

Answer the following questions :

1 **Choose the correct answer from those given :**

1 $\sin 30° =$ ....

(a) 1 (b) $\frac{\sqrt{3}}{2}$ (c) cos 60° (d) $\frac{1}{\sqrt{2}}$

2 The number of diagonals of the hexagon equals ....

(a) 5 (b) 6 (c) 2 (d) 9

3 If O the origin point is the midpoint of $\overline{AB}$ as A = (– 2 , 5) , then B = ...

(a) (2 , 5) (b) (2 , – 5) (c) (– 2 , 5) (d) (– 2 , – 5)

4 If the measure of two angles of a triangle are 70° , 40° , then the number of its axes equals ....

(a) 1 (b) 2 (c) 3 (d) zero

5 If L_1 , L_2 are two parallel straight lines of slopes m_1 , m_2 respectively , then ....

(a) $m_1 - m_2 = \text{zero}$ (b) $m_1 = -m_2$ (c) $m_1 \times m_2 = 1$ (d) $m_1 \times m_2 = -1$

6 If the lengths of two sides of a triangle are 2 cm. , 5 cm. , then the length of the third side can be ....

(a) 2 cm. (b) 3 cm. (c) 4 cm. (d) 1 cm.

---

2 [a] **Without using calculator , find the value of :** cos 60° sin 30° – sin 60° cos 30°

[b] Find the equation of the straight line which makes with the positive direction of X-axis a positive angle of measure 135° and intercepts from the positive part of y-axis a part of length 5 length units.

---

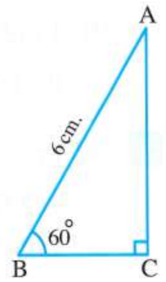
3 [a] Prove that the points A (1 , 4) , B (– 1 , – 2) , C (2 , – 3) are the vertices of a right-angled triangle , find its area.

[b] In the opposite figure :

Δ ABC is a right-angled triangle at C

, AB = 6 cm. , m ($\angle$ B) = 60°

Find : The length of $\overline{AC}$



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4 **[a]** Find the slope of the straight line whose equation is :

$2X - 6y = 12$, then find the points of intersection with the coordinates axes.

[b] Without using calculator , find the value of X (where X is the measure of an acute angle) that satisfies : $\tan X = 4 \cos 60° \sin 30°$

---

5 **[a]** Prove that the straight line which passes through the two points (1 , 3) , (2 , 4) is parallel to the straight line whose equation is : $y - X = 5$

[b] Prove that the figure ABCD is a rectangle where A (1 , 0) , B (– 1 , 4) , C (7 , 8) , D (9 , 4)

21 Luxor Governorate

Answer the following questions :

1 **Choose the correct answer :**

1 The length of the side opposite to the angle of measure 30° in the right-angled triangle equals .... the length of the hypotenuse.

(a) quarter. (b) twice. (c) half. (d) third.

2 If $\tan (2X - 5) = 1$ where X is the measure of an acute angle , then X = ...

(a) 15° (b) 75° (c) 50° (d) 25°

3 If the diagonal length of a square is 10 cm. , then its area = ... cm².

(a) 100 (b) 75 (c) 50 (d) 25

4 The straight line passing by the two points (0 , 0) , (2 , 3) is parallel to the straight line whose slope is ....

(a) $\frac{3}{2}$ (b) $\frac{2}{3}$ (c) $\frac{-3}{2}$ (d) $\frac{-2}{3}$

5 The image of the point (3 , – 2) by reflection in the X-axis is ....

(a) (– 2 , 3) (b) (3 , 2) (c) (2 , – 3) (d) (– 3 , – 2)

6 The slope of the straight line $X - 5 = 0$ is ....

(a) 5 (b) $\frac{1}{5}$ (c) zero (d) undefined.

2 **[a] Find in degrees the value of X if :** $\tan 2X = 4 \sin 30° \cos 30°$ where $0° < X < 90°$

[b] Find the equation of the straight line passing by the point (3 , 5) and is parallel to the straight line $2X - 3y + 6 = 0$

3 **[a]** Prove that the straight line passing by the two points (7 , – 3) , (5 , – 1) is perpendicular to the straight line which makes an angle of measure 45° with the positive direction of X-axis.

[b] Without using the calculator , prove that : $2 \sin 30° + 4 \cos 60° = \tan^2 60°$

4 **[a]** If the distance between the points (a , 0) , (0 , 1) equals $\sqrt{2}$ length unit , find a

[b] If $\overline{AB}$ is a diameter in the circle M where A (4 , – 1) , B (– 2 , 7) , find the coordinates of the point M and the radius length of the circle.

5 **[a]** Prove that the points A (– 1 , – 4) , B (1 , 0) , C (2 , 2) are collinear.

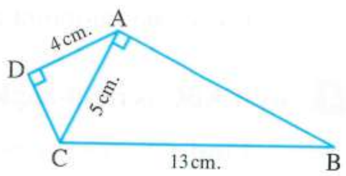
[b] In the opposite figure :

m (∠ ADC) = m (∠ BAC) = 90°

, AD = 4 cm. , AC = 5 cm. , BC = 13 cm.

Find the value of :

tan (∠ DAC) sin (∠ ACB) – sin (∠ B) cos (∠ CAD)



22 Aswan Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer from those given :**

1 The measure of the exterior angle of the equilateral triangle is ....°

(a) 60 (b) 90 (c) 120 (d) 180

2 $4 \sin 30° \cos 60° =$ ....

(a) 1 (b) 2 (c) 3 (d) 4

3 The length of the opposite side of the angle with measure 30° in the right-angled triangle equals .... the length of the hypotenuse.

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

4 The equation of the straight line passing through the point $(-2, -3)$ and parallel to X-axis is ....

(a) $y = -2$ (b) $y = -3$ (c) $X = -2$ (d) $X = -3$

5 ΔABC is an isosceles triangle in which $AB = 3$ cm. , $BC = 7$ cm. , then $AC =$ .... cm.

(a) 3 (b) 4 (c) 7 (d) 10

6 The distance between the two straight lines $X - 2 = 0$, $X + 3 = 0$ equals .... length units.

(a) 1 (b) 2 (c) 3 (d) 5

---

2 [a] Find the equation of the straight line which passes through the two points $(1, 3)$, $(-1, -3)$

[b] Prove that the points $A(3, -1)$, $B(-4, 6)$, $C(2, -2)$ lie on the circle whose centre is $M(-1, 2)$, then find the circumference of the circle.

---

3 [a] **Without using calculator , find the measure of $\angle E$ (Such that E is an acute angle) if :** $2 \sin E = \sin 30° \cos 60° + \cos 30° \sin 60°$

[b] If C is the midpoint of $\overline{AB}$, then find X , y where $A(X, 3)$, $B(6, y)$, $C(4, 6)$

---

4 [a] ΔABC is right-angled at C in which $AC = 6$ cm. , $BC = 8$ cm.

Find : 1 $\cos A \cos B - \sin A \sin B$ 2 $m(\angle B)$

[b] If the straight line L_1 passes through the two points $(3, 1)$, $(2, k)$ and the straight line L_2 makes with the positive direction of the X-axis an angle of measure 45° **, find the value of k if the two straight lines are :** 1 Parallel. 2 Perpendicular.

---

5 [a] Find the equation of the straight line which passes through the point $(3, -5)$ and is parallel to the straight line $X + 2y - 7 = 0$

[b] **Find the value of X if :** $X \sin 30° \cos^2 45° = \sin^2 60°$

23 North Sinai Governorate

Answer the following questions :

1 **Choose the correct answer from those given :**

1 If $a = b$, a , b are the measures of two complementary angles , then $a =$ ....°

(a) 30 (b) 45 (c) 60 (d) 90

2 If $\tan 3X = \sqrt{3}$, where X is the measure of an acute angle , then $X =$ ....°

(a) 10 (b) 20 (c) 30 (d) 60

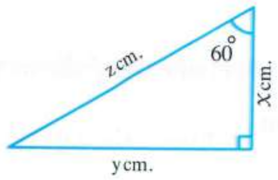
3 The sum of measures of the interior angles of the quadrilateral equals ....°

(a) 360 (b) 180 (c) 90 (d) 540

4 If A (1 , – 6) , B (9 , 2) , then the midpoint of $\overline{AB}$ is ....

(a) (– 2 , 5) (b) (2 , – 5) (c) (5 , – 2) (d) (– 5 , 2)

5 **In the opposite figure :**



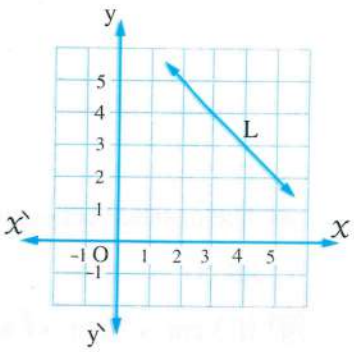
(a) $X + y = z$ (b) $z = X^2 + y^2$

(c) $2X = z$ (d) $y = \frac{1}{2} z$

6 **In the opposite figure :**

L is a straight line passing through the two points (2 , 5) , (5 , 2)

, then the point .... $\in$ L



(a) (1 , 6) (b) (2 , 3)

(c) (0 , 0) (d) (3 , – 4)

---

2 **[a] Without using the calculator , prove that :** $\sin 60° = 2 \sin 30° \cos 30°$

[b] ABCD is a quadrilateral , where A (2 , 4) , B (– 3 , 0) , C (– 7 , 5) , D (– 2 , 9)

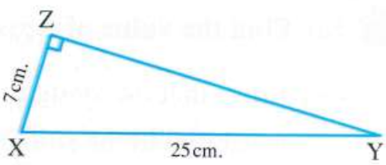
Prove that : ABCD is a square.

---

3 **[a]** Find the equation of the straight line whose slope is 3 and passes through the point (5 , 0)

[b] In the opposite figure : XYZ is a right-angled triangle at Z

, XZ = 7 cm. , XY = 25 cm.



1 **Find the value of :** $\tan X \times \tan Y$

2 **Prove that :** $\sin^2 X + \sin^2 Y = 1$

---

4 **[a] Without using the calculator , find the value of X if :** $2 \sin X = \tan^2 60° - 2 \tan 45°$ where X is the measure of an acute angle.

[b] Prove that the points A (– 1 , – 4) , B (1 , 0) , C (2 , 2) are collinear.

5 **[a]** Prove that the straight line passing through the two points $(-3, -2)$, $(4, 5)$ is parallel to the straight line which makes with the positive direction of the X-axis an angle of measure $45°$

[b] If the straight line passing through the two points $(-2, 3)$, $(1, k)$ is perpendicular to the straight line whose slope equals -3 , then find the value of k

24 Red Sea Governorate

Answer the following questions :

1 **Choose the correct answer from those given :**

1. $2 \sin 30° = \cdots\cdots$
   (a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) 2

2. The measure of the exterior angle of the equilateral triangle equals $\cdots\cdots$
   (a) $30°$ (b) $60°$ (c) $90°$ (d) $120°$

3. The distance between the point $(3, 4)$ and the point of origin equals $\cdots\cdots$ length units.
   (a) 3 (b) 4 (c) 5 (d) 7

4. If 3 cm. , 7 cm. , ℓ are the lengths of the sides of a triangle , then ℓ can be equal to $\cdots\cdots$ cm.
   (a) 3 (b) 7 (c) 4 (d) 10

5. If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{2}{3}$, then the slope of $\overleftrightarrow{CD} = \cdots\cdots$
   (a) $\frac{2}{3}$ (b) $-\frac{2}{3}$ (c) $\frac{3}{2}$ (d) $-\frac{3}{2}$

6. The image of the point $(3, -2)$ by reflection in the origin point is $\cdots\cdots$
   (a) $(-3, 2)$ (b) $(-3, -2)$ (c) $(3, 2)$ (d) $(-2, 3)$

---

2 **[a] Find the value of :** $\cos 60° \sin 30° - \sin 60° \tan 60° + \cos^2 30°$

[b] Prove that the straight line which passes through the two points $(-3, -2)$, $(4, 5)$ is parallel to the straight line which makes an angle of measure $45°$ with the positive direction of the X-axis.

---

3 **[a]** Find the slope of the straight line $3X + 4y - 5 = 0$, then find the length of the intercepted part from y-axis.

[b] Find the value of X where : $X \sin 30° \cos^2 45° = \sin^2 60°$

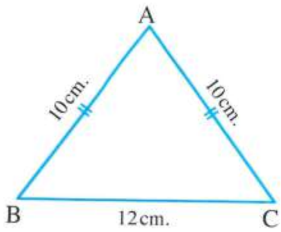
4 **[a] In the opposite figure :**

ABC is a triangle in which AB = AC = 10 cm.

, BC = 12 cm.

1 **Find :** m ($\angle$ B)

2 **Prove that :** $\sin^2 B + \cos^2 B = 1$



[b] Prove that the triangle whose vertices are A (1 , 4) , B (– 1 , – 2) , C (2 , – 3) is right-angled , then find its area.

---

5 **[a]** Find the equation of the straight line which passes through the point A (4 , 6) and the midpoint of $\overline{BC}$ where B (3 , 7) , C (1 , – 3)

[b] ABCD is a parallelogram where A (3 , 3) , B (2 , – 2) , C (5 , – 1) , M is the intersection point of its diagonals. **Find :**

1 The coordinates of M

2 The coordinates of D

25 Matrouh Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer from those given :**

1 The area of the square whose perimeter is 16 cm. equals .... cm^2.

(a) 4 (b) 8 (c) 16 (d) 256

2 The equation of the straight line whose slope is 1 and passes through the origin point is ....

(a) $x = 1$ (b) $y = 1$ (c) $y = x$ (d) $y = -x$

3 If $\cos 2x = \frac{1}{2}$, then $x =$ ....

(a) 15° (b) 30° (c) 45° (d) 60°

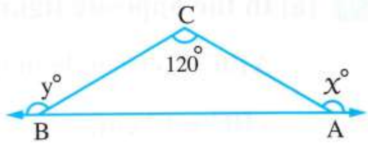
4 A right circular cylinder , if its height equals the length of its base radius = r cm. , then its volume = ... cm^3.

(a) πr^3 (b) $2 \pi r^2$ (c) $2 \pi r^3$ (d) $\frac{4}{3} \pi r^3$

5 The slope of the straight line which is parallel to the x-axis is ....

(a) – 1 (b) zero (c) 1 (d) undefined.

6 **In the opposite figure :**



If m (∠ C) = 120°

, then $x° + y°$ = ...

(a) 90° (b) 180° (c) 300° (d) 360°

---

2 [a] **Without using calculator , find the value of x if :** $4x = \cos^2 30° \tan^2 30° \tan^2 45°$

[b] $\overline{AB}$ is a diameter of the circle M , if B (8 , 11) , M (5 , 7)

, find : 1 The coordinates of A

2 The length of the radius of the circle.

---

3 [a] Prove that the points A (– 2 , 5) , B (3 , 3) , C (– 4 , 2) are not collinear and if D (– 9 , 4) , prove that the figure ABCD is a parallelogram.

[b] **Explaining the steps and without using calculator , find :**

$$\frac{\cos^2 60° + \cos^2 30° - \tan^2 45°}{\sin 60° \tan 60° - \sin 30°}$$

---

4 [a] Find the equation of the straight line which passes through the point (3 , 4) and is perpendicular to the straight line $5x - 2y + 7 = 0$

[b] ABCD is an isosceles trapezoid , $\overline{AD} \parallel \overline{BC}$, AD = 4 cm. , AB = 5 cm. where BC = 12 cm.

Prove that : $\dfrac{5 \tan B \cos C}{\sin^2 C + \cos^2 C} = 3$

---

5 [a] If the straight line L_1 passes through the two points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the x-axis an angle whose measure is 45°

, then find k if the two straight lines L_1 , L_2 are :

1 Parallel. 2 Perpendicular.

[b] **Find the slope and the intercepted part of y-axis by the straight line :** $2x = 3y + 6$

Answers of model examinations of the school book of trigonometry & geometry

Model 1

1

1 a   2 c   3 b

4 a   5 b   6 a

2

[a] $\because \sin 60^\circ = \frac{\sqrt{3}}{2}$ (1)

, $2 \sin 30^\circ \cos 30^\circ = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) : $\therefore \sin 60^\circ = 2 \sin 30^\circ \cos 30^\circ$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{5+1}{6+3} = \frac{2}{3}$

, the slope of $\overleftrightarrow{BC} = \frac{3-5}{3-6} = \frac{2}{3}$

$\therefore$ The slope of $\overleftrightarrow{AB}$ = the slope of $\overleftrightarrow{BC}$

$\therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

, $\because$ B is a common point between the two straight lines.

$\therefore$ The points A , B and C are collinear.

3

[a] $\because 4 \cos 60^\circ \sin 30^\circ = 4 \times \frac{1}{2} \times \frac{1}{2} = 1$

$\therefore \tan X = 1$ $\therefore X = 45^\circ$

[b] Let B (X , y)

$\therefore (6 , -4) = \left(\frac{X+5}{2} , \frac{y-3}{2}\right)$

$\therefore \frac{X+5}{2} = 6$ $\therefore X + 5 = 12$ $\therefore X = 7$

, $\frac{y-3}{2} = -4$ $\therefore y - 3 = -8$ $\therefore y = -5$

$\therefore$ B $(7 , -5)$

4

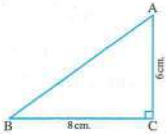
[a] $\because m_1 = \frac{k-1}{2-3} = 1 - k$

, $m_2 = \tan 45^\circ = 1$

, $\because L_1 \parallel L_2$ $\therefore m_1 = m_2$

$\therefore 1 - k = 1$ $\therefore k = 0$

[b] $\because m(\angle C) = 90^\circ$



$\therefore (AB)^2 = (6)^2 + (8)^2$

$= 100$

$\therefore AB = 10$ cm.

1 $\cos A \cos B - \sin A \sin B$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

2 $\because \cos B = \frac{8}{10}$ $\therefore m(\angle B) \simeq 36^\circ\ 52'\ 12''$

5

[a] $\because$ The slope of the straight line = 2

$\therefore$ The equation of the straight line is :

$y = 2X + c$

, $\because (1 , 0)$ satisfies the equation.

$\therefore 0 = 2 \times 1 + c$ $\therefore c = -2$

$\therefore$ The equation of the straight line is : $y = 2X - 2$

[b] $\because MA = \sqrt{(-1-3)^2 + (2+1)^2} = \sqrt{16+9} = \sqrt{25}$

$= 5$ length units

, $MB = \sqrt{(-1+4)^2 + (2-6)^2} = \sqrt{9+16}$

$= \sqrt{25} = 5$ length units

, $MC = \sqrt{(-1-2)^2 + (2+2)^2} = \sqrt{9+16}$

$= \sqrt{25} = 5$ length units

$\therefore MA = MB = MC$

$\therefore$ A , B and C lie on the circle M

, the circumference $= 2 \pi r = 2 \times \pi \times 5$

$= 10 \pi$ length units

Model 2

1

1 a   2 d   3 b

4 c   5 b   6 b

2

[a] $\because \cos E \tan 30^\circ = \cos^2 45^\circ$

$\therefore \cos E \times \frac{1}{\sqrt{3}} = \left(\frac{1}{\sqrt{2}}\right)^2$

$\therefore \cos E = \frac{\sqrt{3}}{2}$ $\therefore m(\angle E) = 30^\circ$

[b] $\because AB = \sqrt{(3-1)^2+(3-5)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units

, $BC = \sqrt{(1-1)^2+(5-3)^2} = \sqrt{4} = 2$ length units

, $AC = \sqrt{(3-1)^2+(3-3)^2} = \sqrt{4} = 2$ length units

$\therefore BC = AC$ $\therefore \Delta ABC$ is isosceles.

3

[a] $\because$ The slope of the straight line $= \frac{-3-3}{-1-1} = 3$

$\therefore$ The equation of the straight line is : $y = 3x + c$

, $\because (1, 3)$ satisfies the equation.

$\therefore 3 = 3 \times 1 + c$ $\therefore c = 0$

$\therefore$ The equation of the straight line is : $y = 3x$

, $\because c = 0$

$\therefore$ The straight line passes through the origin point.

[b] $\because (3, 1) = \left(\frac{1+x}{2}, \frac{y+3}{2}\right)$

$\therefore \frac{1+x}{2} = 3$ $\therefore 1 + x = 6$

$\therefore x = 5$, $\frac{y+3}{2} = 1$

$\therefore y + 3 = 2$ $\therefore y = -1$

$\therefore (x, y) = (5, -1)$

4

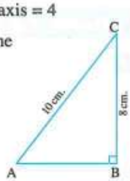
[a] $\because$ The straight line passes through the two points $(1, 0)$ and $(0, 4)$

$\therefore$ The slope $= \frac{4-0}{0-1} = -4$

$\therefore$ The equation of the straight line is : $y = -4x + c$

, $\because$ the intercepted part from y-axis $= 4$

$\therefore$ The equation of the straight line is : $y = -4x + 4$



[b] $\because m(\angle B) = 90°$

$\therefore (AB)^2 = (10)^2 - (8)^2 = 36$

$\therefore AB = 6$ cm.

$\therefore \sin^2 A + 1 = \left(\frac{8}{10}\right)^2 + 1 = \frac{41}{25}$ (1)

, $2\cos^2 C + \cos^2 A = 2 \times \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2 = \frac{41}{25}$ (2)

From (1) , (2) :

$\therefore \sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

5

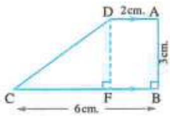
[a] $\because m_1 = \frac{4-3}{2+1} = \frac{1}{3}$

, $m_2 = \frac{1}{3}$ $\therefore m_1 = m_2$ $\therefore L_1 // L_2$

[b] Const : Draw $\overline{DF} \perp \overline{BC}$

Proof : $\because \overline{AD} // \overline{BC}$, $\overline{AB} \perp \overline{BC}$

, $\overline{DF} \perp \overline{BC}$



$\therefore$ ABFD is a rectangle

$\therefore BF = AD = 2$ cm.

, $AB = DF = 3$ cm.

$\therefore FC = 6 - 2 = 4$ cm.

From Δ DFC which is right-angled at F

$\therefore (DC)^2 = (3)^2 + (4)^2 = 25$

$\therefore DC = 5$ cm.

$\therefore \cos(\angle BCD) = \frac{4}{5}$

Answers of model for the merge students

1

1 ✔	2 ✔	3 ✘
4 ✘	5 ✘	6 ✔

2

1 b	2 c	3 d
4 c	5 a	6 c

3

1 0	2 1	3 10
4 2	5 -3	6 $\frac{\sqrt{3}}{2}$

4

1 $\frac{1}{2}$	2 $\frac{3}{5}$	3 3
4 2	5 5 length units	6 $(-5, 2)$

Answers of governorates' examinations of trigonometry & geometry

1 Cairo

1

1 a 2 b 3 a 4 d 5 d 6 c

2

[a] $4 \sin 45° \cos 45° = 4 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = 2$

[b] $\because$ The slope of the given straight line = 3

$\therefore$ The slope of the required straight line = 3

$\therefore$ The equation of the required straight line is : $y = 3x + c$

, $\because$ (1 , 2) satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

3

[a] $\because x \sin 30° = \sin 30° \cos 60° + \cos 30° \sin 60°$

$\therefore \frac{1}{2} x = \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\therefore \frac{1}{2} x = 1$ $\therefore x = 2$

[b] $\because m_1 = \frac{2-5}{3-0} = -1$, $m_2 = \tan 45° = 1$

, $m_1 \times m_2 = -1 \times 1 = -1$

$\therefore$ The two straight lines are perpendicular.

4

[a] $\because$ In the parallelogram , the two diagonals bisect each other.

$\therefore M = \left(\frac{3+1}{2} , \frac{-1+7}{2}\right) = (2 , 3)$

[b] $\because AB = \sqrt{(2+1)^2 + (8-4)^2} = \sqrt{9+16} = \sqrt{25}$
$= 5$ length units.

, $BC = \sqrt{(-1-3)^2 + (4-1)^2} = \sqrt{16+9} = \sqrt{25}$
$= 5$ length units.

, $AC = \sqrt{(2-3)^2 + (8-1)^2} = \sqrt{1+49} = \sqrt{50}$
$= 5\sqrt{2}$ length units.

, $\because (AC)^2 = (AB)^2 + (BC)^2$

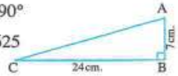
$\therefore \Delta ABC$ is a right-angled triangle at B

, $\because AB = BC$

$\therefore \Delta ABC$ is an isosceles triangle.

5

[a] In ΔABC : $\because m(\angle B) = 90°$



$\therefore (AC)^2 = (7)^2 + (24)^2 = 625$

$\therefore AC = 25$ cm.

1 $3 \tan A \times \tan C = 3 \times \frac{24}{7} \times \frac{7}{24} = 3$

2 $\sin^2 A + \sin^2 C = \left(\frac{24}{25}\right)^2 + \left(\frac{7}{25}\right)^2$
$= \frac{576}{625} + \frac{49}{625} = 1$

[b] Let A (0 , 1) , B (a , 3) , C (2 , 5)

, $\because$ The points are collinear

$\therefore$ The slope of $\overleftrightarrow{AB}$ = the slope of $\overleftrightarrow{AC}$

$\therefore \frac{3-1}{a-0} = \frac{5-1}{2-0}$ $\therefore \frac{2}{a} = 2$ $\therefore a = 1$

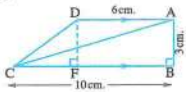
2 Giza

1

1 b 2 b 3 c 4 b 5 c 6 c

2

[a] Draw $\overline{DF} \perp \overline{BC}$



$\because \overline{AD} // \overline{BC}$, $\overline{AB} \perp \overline{BC}$

, $\overline{DF} \perp \overline{BC}$

$\therefore$ ABFD is a rectangle

$\therefore BF = AD = 6$ cm.

$\therefore FC = 4$ cm. , $DF = AB = 3$ cm.

$\therefore$ From Δ DFC which is right-angled at F

$(DC)^2 = 3^2 + 4^2 = 25$ $\therefore DC = 5$ cm.

$\therefore \cos(\angle DCB) - \tan(\angle ACB) = \frac{4}{5} - \frac{3}{10} = \frac{1}{2}$

[b] $\because m_1 = \frac{k-1}{2-3} = 1 - k$, $m_2 = \tan 45° = 1$

, $\because L_1 // L_2$ $\therefore m_1 = m_2$

$\therefore 1 - k = 1$ $\therefore k = 0$

3

[a] In ΔABC : $\because m(\angle A) = 90°$

$\therefore (BC)^2 = (20)^2 + (15)^2 = 625$

$\therefore BC = 25$ cm.

$\therefore \cos C \cos B - \sin C \sin B$

$= \frac{15}{25} \times \frac{20}{25} - \frac{20}{25} \times \frac{15}{25} = 0$

[b] $\because$ The two diagonals of the parallelogram bisect each other

$\therefore M = \left(\frac{3+1}{2}, \frac{-1+7}{2}\right) = (2, 3)$

Let D (x, y)

$\therefore (2, 3) = \left(\frac{6+x}{2}, \frac{2+y}{2}\right)$

$\therefore \frac{6+x}{2} = 2$ $\quad \therefore 6 + x = 4$ $\quad \therefore x = -2$

, $\frac{2+y}{2} = 3$ $\quad \therefore 2 + y = 6$ $\quad \therefore y = 4$

$\therefore D(-2, 4)$

4

[a] $\because \tan x = 4 \sin 30 \cos 60$

$\therefore \tan x = 4 \times \frac{1}{2} \times \frac{1}{2} = 1$

$\therefore x = 45°$

[b] $\because$ The slope of the given straight line $= \frac{-5}{-2} = \frac{5}{2}$

$\therefore$ The slope of the required straight line $= \frac{-2}{5}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-2}{5} x + c$

, $\because (3, 4)$ satisfies the equation.

$\therefore 4 = \frac{-2}{5} \times 3 + c$ $\quad \therefore c = \frac{26}{5}$

$\therefore$ The equation is : $y = \frac{-2}{5} x + \frac{26}{5}$

5

[a] $\because \sqrt{(a-0)^2 + (7-3)^2} = 5$ (squaring both sides)

$\therefore a^2 + (4)^2 = 25$ $\quad \therefore a^2 + 16 = 25$

$\therefore a^2 = 9$ $\quad \therefore a = \pm\sqrt{9}$

$\therefore a = 3$ or $a = -3$

[b] $\because \Delta ABO$ is equilateral

, C is the midpoint of $\overline{AB}$

$\therefore \overline{OC} \perp \overline{AB}$ $\quad \therefore (\angle BOC) = 30°$

$\therefore \tan(\angle BOC) = \tan 30° = \frac{1}{\sqrt{3}}$

$\therefore$ The equation of $\overleftrightarrow{OC}$ is : $y = \frac{1}{\sqrt{3}} x + c$

, $\because O \in \overleftrightarrow{OC}$ $\quad \therefore c = 0$

$\therefore$ The equation of $\overleftrightarrow{OC}$ is : $y = \frac{1}{\sqrt{3}} x$

3 Alexandria

1

1 a   2 c   3 b   4 d   5 a   6 c

2

[a] $\because m(\angle C) = 90°$

$\therefore (AB)^2 = \ell^2 + \ell^2 = 2\ell^2$ $\quad \therefore AB = \sqrt{2}\,\ell$

1 $AC : BC : AB = \ell : \ell : \sqrt{2}\,\ell = 1 : 1 : \sqrt{2}$

2 $\tan B = \frac{\ell}{\ell} = 1$, $\sin A = \frac{\ell}{\sqrt{2}\,\ell} = \frac{1}{\sqrt{2}}$

[b] $\because \sqrt{(x-6)^2 + (5-1)^2} = 2\sqrt{5}$ (squaring both sides)

$\therefore (x-6)^2 + (4)^2 = 20$

$\therefore x^2 - 12x + 36 + 16 - 20 = 0$

$\therefore x^2 - 12x + 32 = 0$ $\quad \therefore (x-8)(x-4) = 0$

$\therefore x = 8$ or $x = 4$

3

[a] 1 Let E be the point of intersection of the two diagonals.

$\therefore E = \left(\frac{3-1}{2}, \frac{2-2}{2}\right) = (1, 0)$

2 $AC = \sqrt{(-1-3)^2 + (-2-2)^2} = \sqrt{16+16} = \sqrt{32}$

$= 4\sqrt{2}$ length units.

$BD = \sqrt{(-2-4)^2 + (3+3)^2} = \sqrt{36+36}$

$= \sqrt{72} = 6\sqrt{2}$ length unit

$\therefore$ The area of the rhombus $= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2}$

$= 24$ square unit.

[b] $\because 2 \sin x = \sin 30° \cos 60° + \cos 30° \sin 60°$

$\therefore 2 \sin x = \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = 1$

$\therefore \sin x = \frac{1}{2}$ $\quad \therefore x = 30°$

4

[a] $\because$ The slope of the given straight line $= \frac{-4+3}{5-2} = \frac{-1}{3}$

$\therefore$ The slope of the required straight line $= 3$

$\therefore$ The equation of the required straight line is :

$y = 3x + c$

, $\because (1, 2)$ satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\quad \therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

[b] $\because \tan 60° = \sqrt{3}$ (1)

$, \frac{2 \tan 30°}{1 - \tan^2 30°} = \frac{2 \times \frac{1}{\sqrt{3}}}{1 - \left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}} = \sqrt{3}$ (2)

From (1) , (2) : $\therefore \tan 60° = \frac{2 \tan 30°}{1 - \tan^2 30°}$

5

[a] $\because m_1 = \frac{k-1}{2-3} = 1 - k$, $m_2 = \tan 45° = 1$

$, \because L_1 \parallel L_2$ $\therefore m_1 = m_2$

$\therefore 1 - k = 1$ $\therefore k = 0$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{3-5}{3+2} = \frac{-2}{5}$

, The slope of $\overleftrightarrow{BC} = \frac{2-3}{-4-3} = \frac{1}{7}$

, $\because$ The slope of $\overleftrightarrow{AB} \neq$ the slope of $\overleftrightarrow{BC}$

$\therefore$ A , B and C are not collinear.

4 El-Kalyoubia

1

1 c 2 d 3 a 4 b 5 d 6 b

2

[a] $\because \frac{x}{2} + \frac{y}{3} = 1$ (multiplying by 3)

$\therefore \frac{3x}{2} + y = 3$ $\therefore y = \frac{-3}{2} x + 3$

$\therefore$ The slope $= \frac{-3}{2}$ and the intercepted part of the y-axis = 3 units.

[b] $\because \sin x = \tan 30° \sin 60°$

$\therefore \sin x = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{2} = \frac{1}{2}$ $\therefore x = 30°$

$\therefore 4 \cos 30° \sin 30° = 4 \times \frac{\sqrt{3}}{2} \times \frac{1}{2} = \sqrt{3}$

3

[a] $\because$ The slope of the given straight line $= \frac{7-1}{2+2} = \frac{3}{2}$

$\therefore$ The slope of the required straight line $= \frac{3}{2}$

$\therefore$ The equation of the required straight line is :

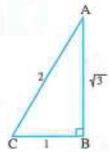
$y = \frac{3}{2} x + c$

, $\because (2 , -5)$ satisfies the equation.

$\therefore -5 = \frac{3}{2} \times 2 + c$ $\therefore c = -8$

$\therefore$ The equation is : $y = \frac{3}{2} x - 8$

[b] $\because 2\,AB = \sqrt{3}\,AC$



$\therefore \frac{AB}{AC} = \frac{\sqrt{3}}{2}$

Let $AB = \sqrt{3}$ length units.

, AC = 2 length units.

$\therefore$ BC = 1 length units.

1 $\sin C = \frac{\sqrt{3}}{2}$ $\therefore m(\angle C) = 60°$

2 $\sin^2 A - \cos^2 C = \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{1}{4} - \frac{1}{4} = 0$

4

[a] $\because m_1 = \frac{-3}{-4} = \frac{3}{4}$, $m_2 = \frac{-4}{a}$

$, \because L_1 \perp L_2$ $\therefore m_1 \times m_2 = -1$

$\therefore \frac{3}{4} \times \frac{-4}{a} = -1$ $\therefore \frac{-3}{a} = -1$ $\therefore a = 3$

[b] $\because AC = \sqrt{(-1-3)^2 + (-2-2)^2}$

$= \sqrt{16 + 16} = \sqrt{32} = 4\sqrt{2}$ length units.

$, BD = \sqrt{(-2-4)^2 + (3+3)^2}$

$= \sqrt{36 + 36} = \sqrt{72} = 6\sqrt{2}$ length units.

$\therefore$ The area $= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2} = 24$ square units.

5

[a] $\because \cos^2 60° = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$ (1)

$, \cos^2 30° \tan^2 30° \tan 45° = \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{1}{\sqrt{3}}\right)^2 \times 1$

$= \frac{1}{4}$ (2)

From (1) , (2) : $\therefore \cos^2 60° = \cos^2 30° \tan^2 30° \tan 45°$

[b] $\because$ C is the midpoint of $\overline{AB}$

$\therefore (3 , 4) = \left(\frac{x+0}{2} , \frac{0+y}{2}\right)$

$\therefore \frac{x}{2} = 3$ $\therefore x = 6$ $\therefore A(6 , 0)$

$, \frac{y}{2} = 4$ $\therefore y = 8$ $\therefore B(0 , 8)$

$\therefore AB = \sqrt{(0-6)^2 + (8-0)^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ length units.

, $\because$ OA = 6 length units , OB = 8 length units.

$\therefore$ The perimeter of Δ AOB = 6 + 8 + 10

= 24 length units.

5 El-Sharkia

1

1 c   2 a   3 d   4 d   5 b   6 c

2

[a] $\because (4 , y) = \left(\frac{x+6}{2} , \frac{3+5}{2}\right)$

$\therefore \frac{x+6}{2} = 4$ $\quad \therefore x+6=8 \quad \therefore x=2$

$, y = \frac{3+5}{2}$ $\quad \therefore y = 4$

$\therefore x + y = 2+4 = 6$

[b] $\because AB = \sqrt{(3-5)^2+(-2-3)^2} = \sqrt{4+25}$

$= \sqrt{29}$ length units.

$, BC = \sqrt{(-2-3)^2+(-4+2)^2} = \sqrt{25+4}$

$= \sqrt{29}$ length units.

$, AC = \sqrt{(-2-5)^2+(-4-3)^2} = \sqrt{49+49}$

$= 7\sqrt{2}$ length units.

$, \because AC \neq AB + BC$

$\therefore$ A , B and C are non collinear

$\therefore$ A , B and C are vertices of a triangle

$, \because (AC)^2 > (AB)^2 + (BC)^2$

$\therefore \Delta ABC$ is an obtuse-angled trianlge.

3

[a] 1 In ΔABC : $\because m(\angle B) = 90°$

$\therefore (AC)^2 = (5)^2 + (12)^2 = 169$

$\therefore AC = 13$ cm.

2 In ΔADC : $5 \tan(\angle ACD) - 13 \sin(\angle DAC)$

$= 5 \times \frac{12}{5} - 13 \times \frac{5}{13} = 7$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{3+1}{5-3} = 2$

$\therefore$ The slope of the axis of symmetry of $\overline{AB} = \frac{-1}{2}$

$\therefore$ The equation of the axis of symmetry of $\overline{AB}$ is :

$y = \frac{-1}{2} x + c$

$, \because$ The midpoint of $\overline{AB} = \left(\frac{3+5}{2} , \frac{-1+3}{2}\right) = (4 , 1)$

$\therefore (4 , 1)$ satisfies the equation.

$\therefore 1 = \frac{-1}{2} \times 4 + c$ $\quad \therefore c = 3$

$\therefore$ The equation is : $y = \frac{-1}{2} x + 3$

4

[a] $\frac{\cos^2 60° + \cos^2 30°}{\sin 60° \tan 60°} = \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2}{\frac{\sqrt{3}}{2} \times \sqrt{3}} = \frac{\frac{1}{4}+\frac{3}{4}}{\frac{3}{2}} = \frac{2}{3}$

[b] 1 $\because L_1 \parallel L_2$ $\quad \therefore m_1 = m_2$

$\therefore \frac{-6}{k} = \frac{2}{3}$ $\quad \therefore k = \frac{-6 \times 3}{2} = -9$

2 $\because L_1 \perp L_2$ $\quad \therefore m_1 \times m_2 = -1$

$\therefore \frac{-6}{k} \times \frac{2}{3} = -1$ $\quad \therefore \frac{-4}{k} = -1$ $\quad \therefore k = 4$

5

[a] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line $= \frac{-1}{2}$

$\therefore$ The equation of the required straight line is :

$y = -\frac{1}{2} x + c$

$, \because (1 , 4)$ satisfies the equation.

$\therefore 4 = -\frac{1}{2} \times 1 + c$ $\quad \therefore c = \frac{9}{2}$

$\therefore$ The equation is : $y = -\frac{1}{2} x + \frac{9}{2}$

[b] 1 $\because$ The two diagonals of the square bisect each other

$\therefore M = \left(\frac{2-7}{2} , \frac{4+5}{2}\right) = \left(\frac{-5}{2} , \frac{9}{2}\right)$

Let D (x , y)

$\therefore \left(\frac{-5}{2} , \frac{9}{2}\right) = \left(\frac{x-3}{2} , \frac{y+0}{2}\right)$

$\therefore \frac{x-3}{2} = \frac{-5}{2}$ $\quad \therefore x-3=-5 \quad \therefore x=-2$

$, \frac{y}{2} = \frac{9}{2}$ $\quad \therefore y = 9 \quad \therefore D(-2 , 9)$

2 $\because AB = \sqrt{(-3-2)^2+(0-4)^2}$

$= \sqrt{25+16} = \sqrt{41}$ length units.

$\therefore$ The area of the square ABCD

$= \left(\sqrt{41}\right)^2 = 41$ square units.

6 El-Monofia

1

1 c   2 a   3 c   4 c   5 b   6 a

2

[a] $\because AB = \sqrt{(1-3)^2 + (4-0)^2} = \sqrt{4+16}$

$= 2\sqrt{5}$ length units.

, $BC = \sqrt{(-1-1)^2 + (2-4)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units.

, $AC = \sqrt{(-1-3)^2 + (2-0)} = \sqrt{16+4}$

$= 2\sqrt{5}$ length units.

$\therefore AB = AC$

$\therefore \Delta ABC$ is an isosceles triangle.

[b] $\dfrac{\tan 45^\circ + \tan 30^\circ}{1 - \tan 45^\circ \tan 30^\circ} = \dfrac{1 + \frac{1}{\sqrt{3}}}{1 - 1 \times \frac{1}{\sqrt{3}}} = \dfrac{1 + \frac{1}{\sqrt{3}}}{1 - \frac{1}{\sqrt{3}}} = 2 + \sqrt{3}$

3

[a] $\because$ The slope of $\overleftrightarrow{AB} = \frac{0-4}{-3-2} = \frac{4}{5}$

, The slope of $\overleftrightarrow{CD} = \frac{9-5}{-2+7} = \frac{4}{5}$

$\therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ (1)

, $\because$ The slope of $\overleftrightarrow{BC} = \frac{5-0}{-7+3} = \frac{-5}{4}$

, The slope of $\overleftrightarrow{AD} = \frac{9-4}{-2-2} = \frac{-5}{4}$

, $\overleftrightarrow{BC} \parallel \overleftrightarrow{AD}$ (2)

From (1) , (2) : $\therefore$ ABCD is a parallelogram

, $\because$ The slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{BC}$

$= \frac{4}{5} \times \frac{-5}{4} = -1$

$\therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$ $\therefore$ ABCD is a rectangle.

, $\because$ The slope of $\overleftrightarrow{AC} = \frac{5-4}{-7-2} = \frac{-1}{9}$

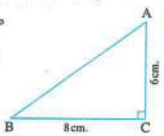
, The slope of $\overleftrightarrow{BD} = \frac{9-0}{-2+3} = 9$

, The slope of $\overleftrightarrow{AC}$ × the slope of $\overleftrightarrow{BD} = \frac{-1}{9} \times 9$

$= -1$

$\therefore \overleftrightarrow{AC} \perp \overleftrightarrow{BD}$ $\therefore$ ABCD is a square.

[b] In ΔABC : $\because m(\angle C) = 90^\circ$



$\therefore (AB)^2 = (6)^2 + (8)^2 = 100$

$\therefore AB = 10$ cm.

$\therefore \cos A \cos B - \sin A \sin B$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

4

[a] $\because m_1 = \frac{5+2}{4+3} = 1$, $m_2 = \tan 45^\circ = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] $\because \sqrt{3} \sin X \tan 30^\circ = \tan 45^\circ \cos 2X$

$\therefore \sqrt{3} \times \sin X \times \frac{1}{\sqrt{3}} = 1 \times \cos 2X$

$\therefore \sin X = \cos 2X$

$\therefore X + 2X = 90^\circ$ $\therefore X = 30^\circ$

5

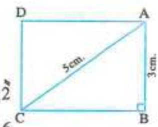
[a] $\because$ The slope of the given straight line $= \frac{-3}{-4} = \frac{3}{4}$

$\therefore$ The slope of the required straight line $= \frac{-4}{3}$

and it intercepts from the positive part of y-axis 4 units.

$\therefore$ The equation is : $y = \frac{-4}{3}X + 4$

[b] 1 In ΔABC :



$\because m(\angle B) = 90^\circ$

$\therefore \sin(\angle ACB) = \frac{3}{5}$

$\therefore m(\angle ACB) \simeq 36^\circ\ 52'\ 12''$

2 $\because (BC)^2 = (5)^2 - (3)^2 = 16$

$\because BC = 4$ cm.

$\therefore$ The area of the rectangle ABCD $= 3 \times 4$

$= 12$ cm^2.

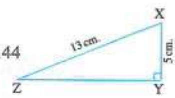
7 El-Gharbia

1

1 a 2 c 3 c 4 b 5 c 6 b

2

[a] $\because m(\angle Y) = 90^\circ$



$\therefore (YZ)^2 = (13)^2 - (5)^2 = 144$

$\therefore YZ = 12$ cm.

$\therefore \cos X \cos Z - \sin X \sin Z$

$= \frac{5}{13} \times \frac{12}{13} - \frac{12}{13} \times \frac{5}{13} = 0$

[b] Let the positive measure of the angle with the positive direction of the X-axis be θ

, $\because$ The slope of $\overleftrightarrow{AB} = \frac{1+2}{6-3} = 1$

$\therefore \tan\theta = 1 \qquad \therefore \theta = 45^\circ$

$\therefore$ The measure of the positive angle that $\overleftrightarrow{AB}$ makes with the negative direction of the x-axis $= 180^\circ - 45^\circ = 135^\circ$

3

[a] $\because \cos(3x + 6^\circ) = \frac{1}{2}$

$\therefore 3x + 6^\circ = 60^\circ$

$\therefore 3x = 54^\circ \qquad \therefore x = 18^\circ$

[b] $\because \frac{y-1}{x} = \frac{1}{3}$

$\therefore 3y - 3 = x \qquad \therefore 3y - x - 3 = 0$

$\therefore$ The slope of the given straight line $= \frac{1}{3}$

$\therefore$ The slope of the required straight line $= \frac{1}{3}$

and intercepts from the negative part of y-axis 3 units.

$\therefore$ The equation is : $y = \frac{1}{3}x - 3$

4

[a] $\because x - \sin 30^\circ \cos^2 45^\circ = \sin^2 60^\circ$

$\therefore x - \frac{1}{2} \times \left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$

$\therefore x - \frac{1}{4} = \frac{3}{4} \qquad \therefore x = 1$

[b] Let D be the midpoint of $\overline{BC}$

$\therefore D = \left(\frac{3+1}{2}, \frac{4-6}{2}\right) = (2, -1)$

$, \because AB = AC \qquad \therefore \overline{AD} \perp \overline{BC}$

$\therefore AD = \sqrt{(2+3)^2 + (-1-0)^2} = \sqrt{25+1}$

$= \sqrt{26}$ length unit.

5

[a] $\because MA = \sqrt{(3+1)^2 + (-1-2)^2} = \sqrt{16+9}$

$= 5$ length unit.

$\therefore$ The circumference of the circle

$= 2 \times \frac{22}{7} \times 5 = 31\frac{3}{7}$ length units.

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{-4+3}{5-2} = \frac{-1}{3}$

$\therefore$ The slope of the required straight line $= 3$

$\therefore$ The equation of the required straight line is :

$y = 3x + c$

$, \because (1, 2)$ satisfies the equation.

$\therefore 2 = 3 \times 1 + c \qquad \therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

8 El-Dakahlia

1

[a] 1 c 2 c 3 d

[b] 1 Let $A(x, 0)$, $B(0, y)$

$\therefore (4, 3) = \left(\frac{x+0}{2}, \frac{0+y}{2}\right)$

$\therefore \frac{x}{2} = 4 \qquad \therefore x = 8 \qquad \therefore A = (8, 0)$

$, \frac{y}{2} = 3 \qquad \therefore y = 6 \qquad \therefore B = (0, 6)$

2 $\because OA = 8$ units , $OB = 6$ units.

$\therefore$ Area of $\Delta AOB = \frac{1}{2} \times 8 \times 6 = 24$ square units.

2

[a] 1 a 2 d 3 c

[b] $\because 2\sin x = \tan^2 60^\circ - 2\tan 45^\circ$

$\therefore 2\sin x = \left(\sqrt{3}\right)^2 - 2 \times 1$

$\therefore 2\sin x = 1 \qquad \therefore \sin x = \frac{1}{2}$

$\therefore x = 30^\circ$

3

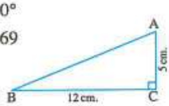
[a] $\because$ The straight line passes through $(2, 0)$, $(0, 3)$

$\therefore$ The slope $= \frac{3-0}{0-2} = \frac{-3}{2}$

and it intercepts from the positive part of y-axis 3 units.

$\therefore$ The equation is : $y = \frac{-3}{2}x + 3$

[b] In ΔABC : $\because m(\angle C) = 90^\circ$



$\therefore (AB)^2 = (12)^2 + (5)^2 = 169$

$\therefore AB = 13$ cm.

$, \cos A \cos B - \sin A \sin B$

$= \frac{5}{13} \times \frac{12}{13} - \frac{12}{13} \times \frac{5}{13} = 0$

4

[a] $\because$ The two diagonals of the parallelogram bisect each other.

$\therefore$ The midpoint of $\overline{AC} = \left(\frac{3+0}{2}, \frac{2-3}{2}\right)$

$= \left(\frac{3}{2}, \frac{-1}{2}\right)$

Let $D(x, y)$

$\therefore \left(\frac{3}{2}, \frac{-1}{2}\right) = \left(\frac{4+x}{2}, \frac{-5+y}{2}\right)$

$\therefore \frac{4+x}{2} = \frac{3}{2} \qquad \therefore 4 + x = 3$

$\therefore x = -1$, $\frac{-5+y}{2} = \frac{-1}{2}$

$\therefore -5 + y = -1$ $\quad \therefore y = 4$ $\quad \therefore D(-1, 4)$

[b] $\because 2\sin 30^\circ + 4\cos 60^\circ = 2 \times \frac{1}{2} + 4 \times \frac{1}{2} = 3$ (1)

, $\tan^2 60^\circ = \left(\sqrt{3}\right)^2 = 3$ (2)

From (1) and (2) :

$\therefore 2\sin 30^\circ + 4\cos 60^\circ = \tan^2 60^\circ$

5

[a] $\because$ The slope of $\overleftrightarrow{AB} = \frac{-7-1}{3-5} = 4$

, The slope of $\overleftrightarrow{BC} = \frac{3+7}{1-3} = -5$

$\therefore$ The slope of $\overleftrightarrow{AB} \neq$ The slope of $\overleftrightarrow{BC}$

$\therefore$ The points A , B and C are not collinear.

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{5-1}{4-2} = 2$

$\therefore$ The slope of the required straight line $= \frac{-1}{2}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-1}{2}x + c$

$\therefore$ The midpoint of $\overline{AB} = \left(\frac{2+4}{2}, \frac{1+5}{2}\right) = (3, 3)$

$\therefore (3, 3)$ satisfies the equation.

$\therefore 3 = \frac{-1}{2} \times 3 + c$ $\quad \therefore c = \frac{9}{2}$

$\therefore$ The equation is : $y = \frac{-1}{2}x + \frac{9}{2}$

9 Ismailia

1

1 c 2 b 3 d 4 b 5 a 6 d

2

[a] In Δ ABC : $\because m(\angle B) = 90^\circ$

$\therefore (AC)^2 = (BC)^2 + (AB)^2$

$\therefore \sin^2 A + \sin^2 C = \left(\frac{BC}{AC}\right)^2 + \left(\frac{AB}{AC}\right)^2$

$$= \frac{(BC)^2}{(AC)^2} + \frac{(AB)^2}{(AC)^2} = \frac{(BC)^2 + (AB)^2}{(AC)^2}$$

$$= \frac{(AC)^2}{(AC)^2} = 1$$

[b] $\because m_1 = \frac{3-4}{-1-2} = \frac{1}{3}$, $m_2 = \frac{1}{3}$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

3

[a] In Δ ABC : $\because m(\angle B) = 90^\circ$

$\therefore \sin(\angle ACB) = \frac{15}{25}$

$\therefore m(\angle ACB) \simeq 36^\circ\ 52'\ 12''$

, $\because (BC)^2 = (25)^2 - (15)^2 = 400$

$\therefore BC = 20$ cm.

$\therefore$ The area of rectangle ABCD $= 15 \times 20$

$= 300 \text{ cm}^2$.

[b] 1 $\because$ The slope of the straight line $= \frac{3-1}{2-1} = 2$

$\therefore$ The equation of the straight line is : $y = 2x + c$

, $\because (1, 1)$ satisfies the equation.

$\therefore 1 = 2 \times 1 + c$ $\quad \therefore c = -1$

$\therefore$ The equation is : $y = 2x - 1$

2 The length of the intercepted part of y-axis is 1 unit.

4

[a] $\because$ The midpoint of $\overline{AC} = \left(\frac{-1+7}{2}, \frac{3+4}{2}\right)$

$= \left(3, \frac{7}{2}\right)$

, the midpoint of $\overline{BD} = \left(\frac{5+1}{2}, \frac{1+6}{2}\right) = \left(3, \frac{7}{2}\right)$

$\therefore$ The midpoint of $\overline{AC}$ = The midpoint of $\overline{BD}$

$\therefore$ ABCD is a parallelogram.

[b] $\because$ The straight line passes through $(3, 0)$, $(0, 4)$

$\therefore$ The slope of straight line $= \frac{4-0}{0-3} = \frac{-4}{3}$

and it intersects from the positive part of y-axis 4 units.

$\therefore$ The equation is : $y = \frac{-4}{3}x + 4$

5

[a] $\sin 45^\circ \cos 45^\circ + \sin 30^\circ \cos 60^\circ - \cos^2 30^\circ$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{2} + \frac{1}{4} - \frac{3}{4} = 0$

[b] 1 $BC = \sqrt{(12-6)^2 + (8-0)^2} = \sqrt{36+64}$

$= 10$ units.

, $AC = \sqrt{(12-2)^2 + (8-3)^2} = \sqrt{100+25}$

$= 5\sqrt{5}$ units.

$\therefore$ Saeid's house is nearer to the school.

2 $\because$ The slope of $\overleftrightarrow{AB} = \frac{0-3}{6-2} = \frac{-3}{4}$

, The slope of $\overleftrightarrow{BC} = \frac{8-0}{12-6} = \frac{4}{3}$

, $\because$ The slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{BC}$

$= \frac{-3}{4} \times \frac{4}{3} = -1$

$\therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

10 Suez

1

1 c   2 b   3 a   4 c   5 a   6 b

2

[a] $\because$ The slope of the straight line = 2 and it intersects from the positive part of y-axis 7 units.

$\therefore$ Its equation is : $y = 2x + 7$

[b] $\because 4x = \cos^2 30° \tan^2 30° \tan^2 45°$

$\therefore 4x = \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{1}{\sqrt{3}}\right)^2 \times (1)^2$

$\therefore 4x = \frac{3}{4} \times \frac{1}{3} \times 1 \qquad \therefore 4x = \frac{1}{4}$

$\therefore x = \frac{1}{16}$

3

[a] $\because$ The diagonals of the parallelogram bisect each other

$\therefore E = \left(\frac{4-2}{2}, \frac{3-3}{2}\right) = (1, 0)$

Let D (x, y)

$\therefore (1, 0) = \left(\frac{0+x}{2}, \frac{2+y}{2}\right)$

$\therefore \frac{x}{2} = 1 \qquad \therefore x = 2$

$, \frac{2+y}{2} = 0 \qquad \therefore 2 + y = 0 \qquad \therefore y = -2$

$\therefore D(2, -2)$

[b] $\because \tan^2 60° - \tan^2 45° = \left(\sqrt{3}\right)^2 - (1)^2 = 3 - 1 = 2 \quad (1)$

$, \sin^2 60° + \cos^2 60° + 2 \sin 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 + 2 \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4} + 1 = 2 \quad (2)$

From (1) , (2) :

$\therefore \tan^2 60° - \tan^2 45°$

$= \sin^2 60° + \cos^2 60° + 2 \sin 30°$

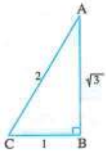
4

[a] $\because m_1 = \frac{3+1}{6-2} = 1 \quad , \quad m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel

[b] $\because 2\,AB = \sqrt{3}\,AC$



$\therefore \frac{AB}{AC} = \frac{\sqrt{3}}{2}$

Let AB $= \sqrt{3}$ length units.

, AC = 2 length units.

$\therefore$ BC = 1 length unit.

$\therefore \sin C = \frac{\sqrt{3}}{2} \quad , \quad \tan A = \frac{1}{\sqrt{3}}$

5

[a] $\because AB = \sqrt{(3+3)^2 + (4-0)^2} = \sqrt{36+16}$

$= 2\sqrt{13}$ length units

$, BC = \sqrt{(1-3)^2 + (-6-4)^2} = \sqrt{4+100}$

$= 2\sqrt{26}$ length units

$, AC = \sqrt{(1+3)^2 + (-6-0)^2} = \sqrt{16+36}$

$= 2\sqrt{13}$ length units.

$\therefore AB = AC$

$\therefore \Delta ABC$ is an isosceles triangle.

[b] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line = 2

$\therefore$ The equation of the required straight line is :

$y = 2x + c$

, $\because$ (3 , 5) satisfies the equation.

$\therefore 5 = 2 \times 3 + c \qquad \therefore c = -1$

$\therefore$ The equation is : $y = 2x - 1$

11 Port Said

1

1 b   2 c   3 d   4 a   5 b   6 d

2

[a] 1 $\sin A \cos B + \cos A \sin B = \frac{12}{13} \times \frac{12}{13} + \frac{5}{13} \times \frac{5}{13}$

$= 1$

2 $1 + \tan^2 A = 1 + \left(\frac{12}{5}\right)^2 = \frac{169}{25}$

[b] $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{2} + \frac{1}{4} - \frac{3}{4} = 0$

3

[a] $\because \sin E = \sin 60° \cos 30° - \cos 60° \sin 30°$

$\therefore \sin E = \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} - \frac{1}{2} \times \frac{1}{2} = \frac{3}{4} - \frac{1}{4} = \frac{1}{2}$

$\therefore m(\angle E) = 30°$

[b] $\because m_1 = \frac{5+2}{4+3} = 1$, $m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

4

[a] $\because$ The slope of the given straight line

$= \frac{-4+3}{5-2} = \frac{-1}{3}$

$\therefore$ The slope of the required straight line = 3

$\therefore$ The equation of the required straight line is :

$y = 3x + c$

, $\because (1 , 2)$ satisfies the equation.

$\therefore 2 = 3 \times 1 + c \qquad \therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

[b] $\because MA = \sqrt{(3+1)^2 + (-1-2)^2} = \sqrt{16+9}$

$= 5$ length units.

, $MB = \sqrt{(-4+1)^2 + (6-2)^2} = \sqrt{9+16}$

$= 5$ length units.

, $MC = \sqrt{(2+1)^2 + (-2-2)^2} = \sqrt{9+16}$

$= 5$ length units.

$\therefore MA = MB = MC$

$\therefore$ The points A , B and C are located on the circle M

5

[a] $\because$ The diagonals of the parallelogram bisect each other

Let E be the point of intersection of the diagonals

$\therefore E = \left(\frac{3+0}{2} , \frac{2-3}{2}\right) = \left(\frac{3}{2} , \frac{-1}{2}\right)$

Let D (x , y)

$\therefore \left(\frac{3}{2} , \frac{-1}{2}\right) = \left(\frac{4+x}{2} , \frac{-5+y}{2}\right)$

$\therefore \frac{4+x}{2} = \frac{3}{2} \qquad \therefore 4 + x = 3 \qquad \therefore x = -1$

, $\frac{-5+y}{2} = \frac{-1}{2} \qquad \therefore -5 + y = -1 \qquad \therefore y = 4$

$\therefore D(-1 , 4)$

[b] [1] $c = 3$ units from the positive part of y-axis

[2] 6 units from the negative part of x-axis

[3] $\because$ The straight line passes through $(-6 , 0)$, $(0 , 3)$

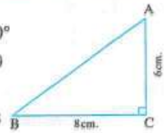
$\therefore$ The slope $= \frac{3-0}{0+6} = \frac{1}{2}$

12 Damietta

1

[1] c [2] b [3] b [4] d [5] c [6] b

2



[a] In $\triangle ABC$: $\because m(\angle C) = 90°$

$\therefore (AB)^2 = (6)^2 + (8)^2 = 100$

$\therefore AB = 10$ cm.

$\therefore \cos A \cos B - \sin A \sin B$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

[b] $\because$ The straight line passes through $(3 , 0)$, $(0 , 2)$

$\therefore$ The slope $= \frac{2-0}{0-3} = \frac{-2}{3}$

and interceptes from the positive part of y-axis 2 units.

$\therefore$ The equation is : $y = \frac{-2}{3}x + 2$

3

[a] $\because \sqrt{(6-x)^2 + (1-5)^2} = 2\sqrt{5}$ (squaring both sides)

$\therefore (6-x)^2 + (-4)^2 = 20$

$\therefore x^2 - 12x + 36 + 16 = 20$

$\therefore x^2 - 12x + 32 = 0$

$\therefore (x-8)(x-4) = 0 \quad \therefore x = 8$ or $x = 4$

[b] The slope $= \frac{1+1}{1-2} = -2$

$\therefore$ The equation is : $y = -2x + c$

, $\because (1 , 1)$ satisfies the equation

$\therefore 1 = -2 \times 1 + c \qquad \therefore c = 3$

$\therefore$ The equation is : $y = -2x + 3$

, $\because (0 , k)$ satisfies the equation :

$\therefore k = -2 \times 0 + 3 \qquad \therefore k = 3$

4

[a] $\because 4x = \cos^2 30° \tan^2 30° \tan^2 45°$

$\therefore 4x = \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{1}{\sqrt{3}}\right)^2 \times (1)^2$

$\therefore 4x = \frac{3}{4} \times \frac{1}{3} \times 1 \quad \therefore 4x = \frac{1}{4}$

$\therefore x = \frac{1}{16}$

[b] $\because m_1 = \frac{3-0}{0-a} = \frac{-3}{a}$, $m_2 = \tan 30° = \frac{1}{\sqrt{3}}$

, $\because$ the two straight lines are perpendicular

$\therefore m_1 \times m_2 = -1 \quad \therefore \frac{-3}{a} \times \frac{1}{\sqrt{3}} = -1 \quad \therefore a = \sqrt{3}$

5

[a] $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2$

$= \frac{1}{2} + \frac{1}{4} - \frac{3}{4} = 0$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{5-3}{3-1} = 1$

$\therefore$ The slope of the required straight line $= -1$

$\therefore$ The equation of the required straight line is :

$y = -x + c$

, $\because C = \left(\frac{1+3}{2}, \frac{3+5}{2}\right) = (2, 4)$

$\therefore (2, 4)$ satisfies the equation.

$\therefore 4 = -2 + c \qquad \therefore c = 6$

$\therefore$ The equation is : $y = -x + 6$

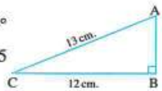
13 Kafr El-Sheikh

1

1 b   2 d   3 c   4 b   5 c   6 b

2

[a] In ΔABC : $\because m(\angle B) = 90°$



$\therefore (AB)^2 = (13)^2 - (12)^2 = 25$

$\therefore AB = 5$ cm.

$\therefore \sin^2 C + \sin^2 A = \left(\frac{5}{13}\right)^2 + \left(\frac{12}{13}\right)^2 = 1$

[b] 1 $\because MA = \sqrt{(5-1)^2 + (2+1)^2} = \sqrt{16+9}$

$= 5$ length units.

$\therefore$ The area $= \pi \times (5)^2 = 25\pi$ square units.

2 $\because$ The slope of $\overleftrightarrow{AM} = \frac{-1-2}{1-5} = \frac{3}{4}$

$\therefore$ The equation is : $y = \frac{3}{4}x + c$

, $\because (1, -1)$ satisfies the equation.

$\therefore -1 = \frac{3}{4} \times 1 + c \qquad \therefore c = -\frac{7}{4}$

$\therefore$ The equation is : $y = \frac{3}{4}x - \frac{7}{4}$

3

[a] $\because$ The slope of $\overleftrightarrow{AB} = \frac{7-5}{-1+3} = 1$

$\therefore$ The slope of the axis of symmetry of $\overline{AB} = -1$

$\therefore$ The equation of the axis of symmetry of $\overline{AB}$ is : $y = -x + c$

, $\because$ The midpoint of $\overline{AB} = \left(\frac{-3-1}{2}, \frac{5+7}{2}\right)$

$= (-2, 6)$

$\therefore (-2, 6)$ satisfies the equation :

$\therefore 6 = 2 + c \qquad \therefore c = 4$

$\therefore$ The equation is : $y = -x + 4$

[b] $\because \tan^2 60° - \tan^2 45° = \left(\sqrt{3}\right)^2 - (1)^2$

$= 3 - 1 = 2 \qquad (1)$

, $\sin^2 60° + \cos^2 60° + 2 \sin 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 + 2 \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4} + 1 = 2 \quad (2)$

From (1) , (2) :

$\therefore \tan^2 60° - \tan^2 45°$

$= \sin^2 60° + \cos^2 60° + 2 \sin 30°$

4

[a] $\because$ The midpoint of $\overline{AC} = \left(\frac{-1+7}{2}, \frac{3+4}{2}\right)$

$= \left(3, \frac{7}{2}\right)$

, The midpoint of $\overline{BD} = \left(\frac{5+1}{2}, \frac{1+6}{2}\right)$

$= \left(3, \frac{7}{2}\right)$

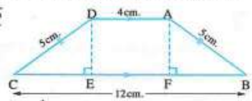
$\therefore$ The midpoint of $\overline{AC}$ = The midpoint of $\overline{BD}$

$\therefore$ A , B , C and D are vertices of a parallelogram.

[b] Draw $\overline{AF} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

$\because \overline{AD} \parallel \overline{BC}$



$\therefore$ AFED is a rectangle

, FE = 4 cm. $\qquad \therefore$ BF + CE = 8 cm.

$\therefore$ BF = CE = 4 cm. ($\Delta ABF \equiv \Delta DCE$)

$\therefore$ From ΔABF which is right at F

$(AF)^2 = (5)^2 - (4)^2 = 9 \quad \therefore AF = 3$ cm.

$\therefore$ DE = AF = 3 cm.

$\therefore \frac{\tan B \cos C}{\cos^2 C + \sin^2 C} = \frac{\frac{3}{4} \times \frac{4}{5}}{\left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2} = \frac{3}{5}$

5

[a] $m_1 = \frac{k-1}{2-3} = 1-k$, $m_2 = \tan 45° = 1$

1 $\because L_1 // L_2$ $\therefore m_1 = m_2$

$\therefore 1-k=1$ $\therefore k=0$

2 $\because L_1 \perp L_2$ $\therefore m_1 \times m_2 = -1$

$\therefore (1-k) \times 1 = -1$ $\therefore 1-k=-1$

$\therefore k=2$

[b] 1 Let A $(x , 0)$, B $(0 , y)$

$\therefore (3 , 4) = \left(\frac{x+0}{2} , \frac{0+y}{2}\right)$

$\therefore \frac{x}{2} = 3$ $\therefore x = 6$ $\therefore$ A $(6 , 0)$

, $\frac{y}{2} = 4$ $\therefore y = 8$ $\therefore$ B $(0 , 8)$

2 $\because$ The slope of $\overleftrightarrow{AB} = \frac{8-0}{0-6} = \frac{-4}{3}$

and it intercepts from the positive part of y-axis 8 units

$\therefore$ The equation of $\overleftrightarrow{AB}$ is : $y = \frac{-4}{3}x + 8$

14 El-Beheira

1

1 b 2 d 3 b 4 c 5 d 6 c

2

[a] $\because m(\angle C) = 90°$

$\therefore (AB)^2 = (8)^2 + (6)^2 = 100$

$\therefore AB = 10$ cm.

1 $\cos A \cos B - \sin A \sin B = \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10}$
$= 0$

2 $\because \cos B = \frac{8}{10}$

$\therefore m(\angle B) \simeq 36° \; 52' \; 12''$

[b] $\because AB = \sqrt{(3+2)^2 + (-1-4)^2} = \sqrt{25+25}$
$= 5\sqrt{2}$ length units.

, $BC = \sqrt{(4-3)^2 + (5+1)^2} = \sqrt{1+36}$
$= \sqrt{37}$ length unit.

, $AC = \sqrt{(4+2)^2 + (5-4)^2} = \sqrt{36+1}$
$= \sqrt{37}$ length units.

$\therefore BC = AC$

$\therefore \Delta ABC$ is an isosceles triangle.

3

[a] $\because \tan^2 60° - \tan^2 45° = \left(\sqrt{3}\right)^2 - (1)^2 = 3 - 1$
$= 2$ (1)

, $\cos^2 30° + \cos^2 60° + 2 \sin 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 + 2 \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4} + 1 = 2$ (2)

From (1) , (2) :

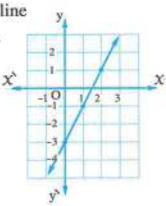
$\therefore \tan^2 60° - \tan^2 45°$

$= \cos^2 30° + \cos^2 60° + 2 \sin 30°$

[b] $\because$ The slope of the straight line = 2 and it intersects from the negative part of y-axis 3 units

$\therefore$ The equation is :

$y = 2x - 3$



4

[a] $\because x \sin 30° \cos^2 45° = \sin^2 60°$

$\therefore x \times \frac{1}{2} \times \left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$

$\therefore \frac{1}{4}x = \frac{3}{4}$ $\therefore x = 3$

[b] $\because m_1 = \frac{k-1}{2-3} = 1-k$, $m_2 = \tan 45° = 1$

, $\because L_1 // L_2$ $\therefore m_1 = m_2$

$\therefore 1-k=1$ $\therefore k=0$

5

[a] $\because (3 , 1) = \left(\frac{1+x}{2} , \frac{y+3}{2}\right)$

$\therefore \frac{1+x}{2} = 3$ $\therefore 1+x=6$ $\therefore x=5$

, $\frac{y+3}{2} = 1$ $\therefore y+3=2$ $\therefore y=-1$

$\therefore$ The point $(x , y) = (5 , -1)$

[b] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line = 2

$\therefore$ The equation of the required straight line is :

$y = 2x + c$

, $\because (3 , -5)$ satisfies the equation.

$\therefore -5 = 2 \times 3 + c$ $\therefore c = -11$

$\therefore$ The equation is : $y = 2x - 11$

15 El-Fayoum

1

1 c 2 b 3 b 4 d 5 a 6 c

2

[a] 1 In ΔABC : $\because m(\angle B) = 90^\circ$

$\therefore \sin(\angle ACB) = \frac{15}{25}$

$\therefore m(\angle ACB) \simeq 36^\circ\ 52'\ 12''$

2 $\because (BC)^2 = (25)^2 - (15)^2 = 400$

$\therefore BC = 20$ cm.

$\therefore$ The area of the rectangle ABCD $= 15 \times 20 = 300\ cm^2$.

[b] $\because \sqrt{(-2-a)^2 + (3-7)^2} = 5$ (squaring both sides)

$\therefore (-2-a)^2 + (-4)^2 = 25$

$\therefore 4 + 4a + a^2 + 16 - 25 = 0$

$\therefore a^2 + 4a - 5 = 0$

$\therefore (a-1)(a+5) = 0 \quad \therefore a = 1$ or $a = -5$

3

[a] $\because 2\sin x = \sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ$

$\therefore 2\sin x = \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\therefore 2\sin x = \frac{1}{4} + \frac{3}{4}$

$\therefore 2\sin x = 1 \quad \therefore \sin x = \frac{1}{2} \quad \therefore x = 30^\circ$

[b] $\because m_1 = \frac{4-3}{2+1} = \frac{1}{3}$, $m_2 = \frac{1}{3}$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

4

[a] $\because AB = \sqrt{(6-5)^2 + (-2-3)^2} = \sqrt{1+25} = \sqrt{26}$ length units.

, $BC = \sqrt{(1-6)^2 + (-1+2)^2} = \sqrt{25+1} = \sqrt{26}$ length units.

, $CD = \sqrt{(0-1)^2 + (4+1)^2} = \sqrt{1+25} = \sqrt{26}$ length units.

, $AD = \sqrt{(0-5)^2 + (4-3)^2} = \sqrt{25+1} = \sqrt{26}$ length units.

$\therefore AB = BC = CD = AD$

$\therefore$ ABCD is a rhombus.

[b] Let D be the midpoint of $\overline{BC}$

$\therefore D = \left(\frac{3+1}{2}, \frac{7-3}{2}\right) = (2, 2)$

$\therefore$ The slope of $\overline{AD} = \frac{-6-2}{5-2} = \frac{-8}{3}$

$\therefore$ The equation of $\overline{AD}$ is : $y = -\frac{8}{3}x + c$

$\therefore D \in \overleftrightarrow{AD}$

$\therefore (2, 2)$ satisfies its equation

$\therefore 2 = \frac{-8}{3} \times 2 + c \quad \therefore c = \frac{22}{3}$

$\therefore$ The equation of $\overleftrightarrow{AD}$ is : $y = \frac{-8}{3}x + \frac{22}{3}$

5

[a] L.H.S. $= \frac{\cos^2 60^\circ + \cos^2 30^\circ + \tan^2 45^\circ}{\sin 60^\circ \tan 60^\circ - \sin 30^\circ}$

$= \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + (1)^2}{\frac{\sqrt{3}}{2} \times \sqrt{3} - \frac{1}{2}} = \frac{\frac{1}{4} + \frac{3}{4} + 1}{\frac{3}{2} - \frac{1}{2}} = 2 =$ R.H.S.

[b] $\because m_1 = \frac{y-1}{2-3} = 1 - y$, $m_2 = \tan 45^\circ = 1$

, $\because L_1 \perp L_2 \quad \therefore m_1 \times m_2 = -1$

$\therefore (1-y) \times 1 = -1 \quad \therefore 1 - y = -1$

$\therefore y = 2$

16 Beni Suef

1

1 c 2 a 3 d 4 b 5 b 6 c

2

[a] $\because AB = \sqrt{(5+1)^2 + (1-3)^2} = \sqrt{36+4} = 2\sqrt{10}$ length units.

, $BC = \sqrt{(6-5)^2 + (4-1)^2} = \sqrt{1+9} = \sqrt{10}$ length units.

$\therefore$ The area of rectangle ABCD $= 2\sqrt{10} \times \sqrt{10} = 20$ square units.

[b] $\because x \cos 60^\circ = \sin 30^\circ + \tan 45^\circ$

$\therefore x \times \frac{1}{2} = \frac{1}{2} + 1 \quad \therefore \frac{1}{2}x = \frac{3}{2}$

$\therefore x = 3$

3

[a] $\because m_1 = \frac{4-0}{3+1} = 1$, $m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] In ΔABC : $\because m(\angle A) = 90°$

$\therefore (BC)^2 = (20)^2 + (15)^2 = 625$

$\therefore BC = 25$ cm.

$\therefore \cos C \cos B - \sin C \sin B$

$= \frac{15}{25} \times \frac{20}{25} - \frac{20}{25} \times \frac{15}{25} = 0$

4

[a] $\because (x , -3) = \left(\frac{-3+9}{2} , \frac{y+11}{2}\right)$

$\therefore x = \frac{-3+9}{2}$ $\qquad \therefore x = 3$

$, \frac{y+11}{2} = -3$ $\qquad \therefore y + 11 = -6$

$\therefore y = -17$ $\qquad \therefore x + y = 3 - 17 = -14$

[b] $\sin 45° \cos 45° + 3 \sin 30° \cos 60° - \cos^2 30°$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + 3 \times \frac{1}{2} \times \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2$

$= \frac{1}{2} + \frac{3}{4} - \frac{3}{4} = \frac{1}{2}$

5

[a] $\because$ The slope of the given straight line = 2

$\therefore$ The slope of the required straight line $= \frac{-1}{2}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-1}{2} x + c$

$, \because (2 , -5)$ satisfies the equation.

$\therefore -5 = \frac{-1}{2} \times 2 + c$ $\qquad \therefore c = -4$

$\therefore$ The equation is : $y = \frac{-1}{2} x - 4$

[b] $\because$ The slope of $\overleftrightarrow{AD} = \frac{1-3}{-2-2} = \frac{1}{2}$

, The slope of $\overleftrightarrow{BC} = \frac{-1-2}{0-6} = \frac{1}{2}$

$\therefore$ The slope of $\overleftrightarrow{AD}$ = the slope of $\overleftrightarrow{BC}$

$\therefore \overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$ (1)

$, \because$ The slope of $\overleftrightarrow{AB} = \frac{2-3}{6-2} = \frac{-1}{4}$

, the slope of $\overleftrightarrow{CD} = \frac{1+1}{-2-0} = -1$

$\therefore$ The slope of $\overleftrightarrow{AB} \neq$ The slope of $\overleftrightarrow{CD}$

$\therefore \overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are not parallel (2)

From (1) , (2) : $\therefore$ ABCD is a trapezoid

17 El-Menia

1

1 c 2 d 3 a 4 b 5 c 6 c

2

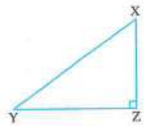
[a] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{-4-0}{2-6} = 1$

, The slope of $\overleftrightarrow{BC} = m_2 = \frac{2+4}{-4-2} = -1$

$, \because m_1 \times m_2 = 1 \times -1 = -1$ $\qquad \therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

$\therefore \Delta ABC$ is right-angled at B

[b] $\tan X \tan Y = \frac{YZ}{XZ} \times \frac{XZ}{YZ} = 1$



3

[a] $\because 4x = \cos^2 30° \tan^2 30° \tan^2 45°$

$\therefore 4x = \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{1}{\sqrt{3}}\right)^2 \times (1)^2$

$\therefore 4x = \frac{3}{4} \times \frac{1}{3} \times 1$ $\qquad \therefore 4x = \frac{1}{4}$

$\therefore x = \frac{1}{16}$

[b] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line $= \frac{-1}{2}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-1}{2} x + c$

$, \because (3 , -5)$ satisfies the equation.

$\therefore -5 = \frac{-1}{2} \times 3 + c$ $\qquad \therefore c = \frac{-7}{2}$

$\therefore$ The equation is : $y = -\frac{1}{2} x - \frac{7}{2}$

4

[a] $\because$ The diagonals of the parallelogram bisect each other

Let M be the point of intersection of the two diagonals.

$\therefore M = \left(\frac{-2-4}{2} , \frac{5+2}{2}\right) = \left(-3 , \frac{7}{2}\right)$

Let D (x , y)

$\therefore \left(-3 , \frac{7}{2}\right) = \left(\frac{3+x}{2} , \frac{3+y}{2}\right)$

$\therefore \frac{3+x}{2} = -3$ $\qquad \therefore 3 + x = -6$ $\qquad \therefore x = -9$

$, \frac{3+y}{2} = \frac{7}{2}$ $\qquad \therefore 3 + y = 7$ $\qquad \therefore y = 4$

$\therefore D(-9 , 4)$

[b] $\because \sin^2 30° = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$ (1)

$, 5\cos^2 60° - \tan^2 45° = 5 \times \left(\frac{1}{2}\right)^2 - (1)^2$

$= \frac{5}{4} - 1 = \frac{1}{4}$ (2)

From (1) , (2) : $\therefore \sin^2 30° = 5\cos^2 60° - \tan^2 45°$

5

[a] $\because m_1 = \frac{k-1}{2-3} = 1 - k$, $m_2 = \tan 45° = 1$

$, \because L_1 \perp L_2$ $\therefore m_1 \times m_2 = -1$

$\therefore (1-k) \times 1 = -1$ $\therefore 1 - k = -1$

$\therefore k = 2$

[b] $\because$ The straight line passes through (2 , 0) , (0 , 3)

$\therefore$ The slope of the straight line $= \frac{3-0}{0-2} = \frac{-3}{2}$

and intersects from the positive part of y-axis 3 units.

$\therefore$ The equation is : $y = \frac{-3}{2}x + 3$

18 Assiut

1

1 b 2 a 3 b 4 c 5 b 6 c

2

[a] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{5+1}{6+3} = \frac{2}{3}$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{3-5}{3-6} = \frac{2}{3}$

$\therefore m_1 = m_2$ $\therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

, $\because$ B is a common point

$\therefore$ A , B and C are collinear

[b] $\because x \sin 30° \cos^2 45° = \sin^2 60°$

$\therefore x \times \frac{1}{2} \times \left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$

$\therefore \frac{1}{4}x = \frac{3}{4}$ $\therefore x = 3$

3

[a] $\because \Delta XYZ$ is right-angled at Y

$\therefore \overline{XY} \perp \overline{YZ}$, the slope of $\overleftrightarrow{XY} = \frac{5-2}{3-4} = -3$

$\therefore$ The slope of $\overleftrightarrow{YZ} = \frac{1}{3}$

, $\because$ the slope of $\overleftrightarrow{YZ} = \frac{a-2}{-5-4} = \frac{a-2}{-9} = \frac{1}{3}$

$\therefore a - 2 = -3$ $\therefore a = -1$

[b] $\because$ The slope of the straight line = 2 and it intersects from the positive part of y-axis 7 units.

$\therefore$ Its equation is : $y = 2x + 7$

4

[a] 1 In ΔABC : $\because m(\angle B) = 90°$

$\therefore \sin(\angle ACB) = \frac{15}{25}$

$\therefore m(\angle ACB) \simeq 36° \ 52' \ 12''$

2 $\because (BC)^2 = (25)^2 - (15)^2 = 400$

$\therefore BC = 20$ cm.

$\therefore$ The area of the rectangle ABCD = 15 × 20 = 300 cm^2.

[b] $\because m_1 = \frac{0-3}{0-2} = \frac{3}{2}$, $m_2 = \frac{7-4}{1+1} = \frac{3}{2}$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

5

[a] $\because AB = \sqrt{(6-5)^2 + (-2-3)^2} = \sqrt{1+25}$

$= \sqrt{26}$ length units.

$, BC = \sqrt{(1-6)^2 + (-1+2)^2} = \sqrt{25+1}$

$= \sqrt{26}$ length units.

$, CD = \sqrt{(0-1)^2 + (4+1)^2} = \sqrt{1+25}$

$= \sqrt{26}$ length units.

$, AD = \sqrt{(0-5)^2 + (4-3)^2} = \sqrt{25+1}$

$= \sqrt{26}$ length units.

$\therefore AB = BC = CD = AD$

$\therefore$ ABCD is a rhombus.

[b] $\because 2x - 3y - 6 = 0$ $\therefore 3y = 2x - 6$

$\therefore y = \frac{2}{3}x - 2$

$\therefore$ The slope $= \frac{2}{3}$ and the intercepted part = 2 units from the negative part of y-axis.

19 Souhag

1

1 b 2 c 3 a 4 c 5 a 6 b

2

[a] Let B (x , y)

$\therefore (2 , 3) = \left(\frac{x-1}{2} , \frac{y+3}{2}\right)$

$\therefore \frac{x-1}{2} = 2$ $\therefore x - 1 = 4$ $\therefore x = 5$

$, \frac{y+3}{2} = 3$ $\therefore y + 3 = 6$ $\therefore y = 3$

$\therefore$ B (5 , 3)

[b] 1 $\because \cos X = \sin 30° \cos 60°$

$\therefore \cos X = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$\therefore X \simeq 75° \ 31' \ 21''$

2 $\tan 75° \ 31' \ 21'' \simeq 3.873$

3

[a] $\because m_1 = \frac{-a}{2}$, $m_2 = \tan 45° = 1$

, $\because$ the two straight lines are parallel

$\therefore m_1 = m_2$ $\therefore \frac{-a}{2} = 1$

$\therefore a = -2$

[b] $\because \tan^2 60° - \tan^2 45° = \left(\sqrt{3}\right)^2 - (1)^2$

$= 3 - 1 = 2$ (1)

, $4 \sin 30° = 4 \times \frac{1}{2} = 2$ (2)

From (1) , (2) : $\therefore \tan^2 60° - \tan^2 45° = 4 \sin 30°$

4

[a] 1 In Δ ABC : $\because m(\angle B) = 90°$

$\therefore \sin(\angle ACB) = \frac{6}{10}$

$\therefore m(\angle ACB) \simeq 36° \ 52' \ 12''$

2 $\because (BC)^2 = (10)^2 - (6)^2 = 64$

$\therefore BC = 8$ cm.

$\therefore$ The area of the rectangle ABCD $= 6 \times 8$

$= 48 \text{ cm}^2$.

[b] $\because$ The slope of the given straight line $= \frac{-1}{3}$

$\therefore$ The slope of the required straight line $= 3$

$\therefore$ The equation of the required straight line is :

$y = 3X + c$

, $\because (1 , 2)$ satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\therefore c = -1$

$\therefore$ The equation is : $y = 3X - 1$

5

[a] $\because MA = \sqrt{(3+1)^2 + (-1-2)^2} = \sqrt{16+9}$

$= 5$ length units.

, $MB = \sqrt{(-4+1)^2 + (6-2)^2} = \sqrt{9+16}$

$= 5$ length units.

, $MC = \sqrt{(2+1)^2 + (-2-2)^2} = \sqrt{9+16}$

$= 5$ length units.

$\therefore MA = MB = MC$

$\therefore$ A , B and C belong to the circle M

, its area $= \pi \times (5)^2 = 25\pi$ square units.

[b] $\because 4X + 5y - 10 = 0$ $\therefore 5y = -4X + 10$

$\therefore y = \frac{-4}{5}X + 2$

$\therefore$ The slope $= \frac{-4}{5}$ and the intercepted part $= 2$ units from the positive part of y-axis 2

20 Qena

1

1 c 2 d 3 b 4 a 5 a 6 c

2

[a] $\cos 60° \sin 30° - \sin 60° \cos 30°$

$= \frac{1}{2} \times \frac{1}{2} - \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = \frac{1}{4} - \frac{3}{4} = \frac{-1}{2}$

[b] $\because$ The slope of the straight line $= \tan 135° = -1$

and it intercepts from the positive part of y-axis 5 units.

$\therefore$ Its equation is : $y = -X + 5$

3

[a] $\because AB = \sqrt{(-1-1)^2 + (-2-4)^2} = \sqrt{4+36}$

$= 2\sqrt{10}$ length units.

, $BC = \sqrt{(2+1)^2 + (-3+2)^2} = \sqrt{9+1}$

$= \sqrt{10}$ length units.

, $AC = \sqrt{(2-1)^2 + (-3-4)^2} = \sqrt{1+49}$

$= 5\sqrt{2}$ length units.

, $\because (AC)^2 = (AB)^2 + (BC)^2$

$\therefore \Delta$ ABC is right-angled triangle at B

, its area $= \frac{1}{2} \times AB \times BC = \frac{1}{2} \times 2\sqrt{10} \times \sqrt{10}$

$= 10$ square units.

[b] In Δ ABC : $\because m(\angle C) = 90°$

$\therefore \sin B = \frac{AC}{AB}$ $\therefore \sin 60° = \frac{AC}{6}$

$\therefore AC = 6 \sin 60° = 6 \times \frac{\sqrt{3}}{2} = 3\sqrt{3}$ cm.

4

[a] The slope $= \frac{-2}{-6} = \frac{1}{3}$

Put $X = 0$ $\therefore 2 \times 0 - 6y = 12$

$\therefore -6y = 12$ $\therefore y = -2$

$\therefore$ The intersection point with y-axis is : $(0 , -2)$

Put $y = 0$

$\therefore 2X - 6 \times 0 = 12$ $\therefore 2X = 12$ $\therefore X = 6$

$\therefore$ The intersection point with X-axis is : $(6 , 0)$

[b] $\because \tan X = 4 \cos 60° \sin 30°$

$\therefore \tan X = 4 \times \frac{1}{2} \times \frac{1}{2}$ $\therefore \tan X = 1$

$\therefore X = 45°$

5

[a] $\because m_1 = \frac{4-3}{2-1} = 1$, $m_2 = \frac{1}{1} = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] $\because$ The midpoint of $\overline{AC} = \left(\frac{7+1}{2} , \frac{0+8}{2} \right)$

$= (4 , 4)$

, the midpoint of $\overline{BD} = \left(\frac{-1+9}{2} , \frac{4+4}{2} \right)$

$= (4 , 4)$

$\therefore$ The midpoint of $\overline{AC}$ = the midpoint of $\overline{BD}$

$\therefore$ The two diagonals bisect each other

$\therefore$ ABCD is a parallelogram.

, $\because$ the slope of $\overleftrightarrow{AB} = \frac{4-0}{-1-1} = -2$

, the slope of $\overleftrightarrow{BC} = \frac{8-4}{7+1} = \frac{1}{2}$

, the slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{BC} = -2 \times \frac{1}{2}$

$= -1$

$\therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$ $\therefore$ ABCD is a rectangle.

21 Luxor

1

1 c	2 d	3 c	4 a	5 b	6 d

2

[a] $\because \tan 2X = 4 \sin 30° \cos 30°$

$\therefore \tan 2X = 4 \times \frac{1}{2} \times \frac{\sqrt{3}}{2}$ $\therefore \tan 2X = \sqrt{3}$

$\therefore 2X = 60°$ $\therefore X = 30°$

[b] $\because$ The slope of the given straight line $= \frac{-2}{-3} = \frac{2}{3}$

$\therefore$ The slope of the required straight line $= \frac{2}{3}$

$\therefore$ The equation of the required straight line is :

$y = \frac{2}{3} X + c$

, $\because$ (3 , 5) satisfies the equation.

$\therefore 5 = \frac{2}{3} \times 3 + c$ $\therefore c = 3$

$\therefore$ The equation is : $y = \frac{2}{3} X + 3$

3

[a] $\because m_1 = \frac{-1+3}{5-7} = -1$, $m_2 = \tan 45° = 1$

, $\because m_1 \times m_2 = -1 \times 1 = -1$

$\therefore$ The two straight lines are perpendicular.

[b] $\because 2 \sin 30° + 4 \cos 60° = 2 \times \frac{1}{2} + 4 \times \frac{1}{2}$

$= 1 + 2 = 3$ (1)

, $\tan^2 60° = \left(\sqrt{3}\right)^2 = 3$ (2)

From (1) , (2) : $\therefore 2 \sin 30° + 4 \cos 60° = \tan^2 60°$

4

[a] $\because \sqrt{(0-a)^2 + (1-0)^2} = \sqrt{2}$ (squaring both sides)

$\therefore a^2 + 1 = 2$ $\therefore a^2 = 1$

$\therefore a = 1$ or $a = -1$

[b] $M = \left(\frac{4-2}{2} , \frac{-1+7}{2} \right) = (1 , 3)$

, $MA = \sqrt{(4-1)^2 + (-1-3)^2} = \sqrt{9+16}$

$= 5$ length units.

5

[a] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{0+4}{1+1} = 2$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{2-0}{2-1} = 2$

$\therefore m_1 = m_2$ $\therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

, $\because$ B is a common point

$\therefore$ A , B and C are collinear.

[b] In Δ ADC : $\because$ m ($\angle$ D) = 90°

$\therefore (CD)^2 = (5)^2 - (4)^2 = 9$ $\therefore$ CD = 3 cm.

In Δ CAB : $\therefore$ m ($\angle$ CAB) = 90°

$\therefore (AB)^2 = (13)^2 - (5)^2 = 144$ $\therefore$ AB = 12 cm.

$\therefore$ tan ($\angle$ DAC) sin ($\angle$ ACB)

$-$ sin ($\angle$ B) cos ($\angle$ CAD)

$= \frac{3}{4} \times \frac{12}{13} - \frac{5}{13} \times \frac{4}{5} = \frac{5}{13}$

22 Aswan

1

1 c	2 a	3 c	4 b	5 c	6 d

2

[a] $\because$ The slope of the straight line $= \frac{-3-3}{-1-1} = 3$

$\therefore$ The equation of the straight line is : $y = 3X + c$

, $\because$ (1 , 3) satisfies the equation :

$\therefore 3 = 3 \times 1 + c \qquad \therefore c = 0$

$\therefore$ The equation is : $y = 3x$

[b] $\because MA = \sqrt{(3+1)^2 + (-1-2)^2} = \sqrt{16+9}$

$= 5$ length units.

, $MB = \sqrt{(-4+1)^2 + (6-2)^2} = \sqrt{9+16}$

$= 5$ length units.

, $MC = \sqrt{(2+1)^2 + (-2-2)^2} = \sqrt{9+16}$

$= 5$ length units.

, $\because MA = MB = MC$

$\therefore$ A , B and C lie on the circle M

, its circumference $= 2 \times \pi \times 5$

$= 10\,\pi$ length units.

3

[a] $\because 2 \sin E = \sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ$

$\therefore 2 \sin E = \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\therefore 2 \sin E = 1 \qquad \therefore \sin E = \frac{1}{2} \qquad \therefore E = 30^\circ$

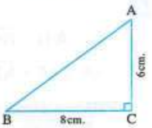
[b] $\because (4 , 6) = \left(\frac{x+6}{2} , \frac{3+y}{2}\right)$

$\therefore \frac{x+6}{2} = 4 \qquad \therefore x + 6 = 8 \qquad \therefore x = 2$

, $\frac{3+y}{2} = 6 \qquad \therefore 3 + y = 12 \qquad \therefore y = 9$

4

[a] In ΔABC : $\because m(\angle C) = 90^\circ$



$\therefore (AB)^2 = (6)^2 + (8)^2 = 100$

$\therefore AB = 10$ cm.

1 $\cos A \cos B - \sin A \sin B$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

2 $\because \sin B = \frac{6}{10}$

$\therefore m(\angle B) \simeq 36^\circ\ 52'\ 12''$

[b] $m_1 = \frac{k-1}{2-3} = 1 - k \quad , \quad m_2 = \tan 45^\circ = 1$

1 $\because L_1 \parallel L_2 \qquad \therefore m_1 = m_2$

$\therefore 1 - k = 1 \qquad \therefore k = 0$

2 $\because L_1 \perp L_2 \qquad \therefore m_1 \times m_2 = -1$

$\therefore (1-k) \times 1 = -1 \qquad \therefore 1 - k = -1$

$\therefore k = 2$

5

[a] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line $= \frac{-1}{2}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-1}{2}x + c$

, $\because (3 , -5)$ satisfies the equation.

$\therefore -5 = \frac{-1}{2} \times 3 + c \qquad \therefore c = \frac{-7}{2}$

$\therefore$ The equation is : $y = \frac{-1}{2}x - \frac{7}{2}$

[b] $\because x \sin 30^\circ \cos^2 45^\circ = \sin^2 60^\circ$

$\therefore x \times \frac{1}{2} \times \left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$

$\therefore \frac{1}{4}x = \frac{3}{4} \qquad \therefore x = 3$

23 North Sinai

1

1 b 2 b 3 a 4 c 5 c 6 a

2

[a] $\because \sin 60^\circ = \frac{\sqrt{3}}{2}$ (1)

, $2 \sin 30^\circ \cos 30^\circ = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) :

$\therefore \sin 60^\circ = 2 \sin 30^\circ \cos 30^\circ$

[b] $\because AB = \sqrt{(-3-2)^2 + (0-4)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units.

, $BC = \sqrt{(-7+3)^2 + (5-0)^2} = \sqrt{16+25}$

$= \sqrt{41}$ length units.

, $CD = \sqrt{(-2+7)^2 + (9-5)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units.

, $AD = \sqrt{(-2-2)^2 + (9-4)^2} = \sqrt{16+25}$

$= \sqrt{41}$ length units.

, $\because AB = BC = CD = AD$

$\therefore$ ABCD is a rhombus

, $\because AC = \sqrt{(-7-2)^2 + (5-4)^2} = \sqrt{81+1}$

$= \sqrt{82}$ length units.

$, BD = \sqrt{(-2+3)^2 + (9-0)^2} = \sqrt{1+81}$

$= \sqrt{82}$ length units.

$\therefore AC = BD$

$\therefore$ ABCD is a square.

3

[a] $\because$ The slope of the straight line $= 3$

$\therefore$ The equation of the straight line is : $y = 3x + c$

$, \because (5 , 0)$ satisfies the equation.

$\therefore 0 = 3 \times 5 + c \qquad \therefore c = -15$

$\therefore$ The equation is : $y = 3x - 15$

[b] In ΔXYZ : $\because m(\angle Z) = 90°$

$\therefore (YZ)^2 = (25)^2 - (7)^2 = 576$

$\therefore YZ = 24$ cm.

1 $\tan X \tan Y = \frac{24}{7} \times \frac{7}{24} = 1$

2 $\sin^2 X + \sin^2 Y = \left(\frac{24}{25}\right)^2 + \left(\frac{7}{25}\right)^2 = 1$

4

[a] $\because 2 \sin x = \tan^2 60° - 2 \tan 45°$

$\therefore 2 \sin x = \left(\sqrt{3}\right)^2 - 2 \times 1$

$\therefore 2 \sin x = 3 - 2 \qquad \therefore 2 \sin x = 1$

$\therefore \sin x = \frac{1}{2} \qquad \therefore x = 30°$

[b] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{0+4}{1+1} = 2$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{2-0}{2-1} = 2$

$\therefore m_1 = m_2 \qquad \therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

$, \because$ B is a common point.

$\therefore$ A , B and C are collinear.

5

[a] $\because m_1 = \frac{5+2}{4+3} = 1 \quad , \quad m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel

[b] $\because m_1 = \frac{k-3}{1+2} = \frac{k-3}{3} \quad , \quad m_2 = -3$

$, \because$ The two straight lines are perpendicular

$\therefore m_1 \times m_2 = -1 \qquad \therefore \frac{k-3}{3} \times -3 = -1$

$\therefore 3 - k = -1 \qquad \therefore k = 4$

24 Red Sea

1

1 c   2 d   3 c   4 b   5 d   6 a

2

[a] $\cos 60° \sin 30° - \sin 60° \tan 60° + \cos^2 30°$

$= \frac{1}{2} \times \frac{1}{2} - \frac{\sqrt{3}}{2} \times \sqrt{3} + \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{4} - \frac{3}{2} + \frac{3}{4} = \frac{-1}{2}$

[b] $\because m_1 = \frac{5+2}{4+3} = 1 \quad , \quad m_2 = \tan 45° = 1$

$, \because m_1 = m_2$

$\therefore$ The two straight lines are parallel.

3

[a] $\because 3x + 4y - 5 = 0 \qquad \therefore 4y = -3x + 5$

$\therefore y = \frac{-3}{4} x + \frac{5}{4} \qquad \therefore$ The slope $= \frac{-3}{4}$

and the intercepted part $= \frac{5}{4}$ from the positive part of y-axis

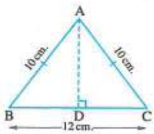
[b] $\because x \sin 30° \cos^2 45° = \sin^2 60°$

$\therefore x \times \frac{1}{2} \times \left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$

$\therefore \frac{1}{4} x = \frac{3}{4} \qquad \therefore x = 3$

4

[a] Draw : $\overline{AD} \perp \overline{BC}$



$\because AB = AC , \overline{AD} \perp \overline{BC}$

$\therefore BD = CD = 6$ cm.

In ΔABD :

$\because m(\angle ADB) = 90°$

$\therefore (AD)^2 = (10)^2 - (6)^2 = 64 \qquad \therefore AD = 8$ cm.

1 $\because \cos B = \frac{6}{10} \qquad \therefore m(\angle B) \simeq 53° \, 7' \, 48''$

2 $\sin^2 B + \cos^2 B = \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2 = 1$

[b] $\because AB = \sqrt{(-1-1)^2 + (-2-4)^2} = \sqrt{4+36}$

$= 2\sqrt{10}$ length units.

$, BC = \sqrt{(2+1)^2 + (-3+2)^2} = \sqrt{9+1}$

$= \sqrt{10}$ length units.

$, AC = \sqrt{(2-1)^2 + (-3-4)^2} = \sqrt{1+49}$

$= 5\sqrt{2}$ length units.

$, \because (AC)^2 = (AB)^2 + (BC)^2$

$\therefore \Delta ABC$ is right-angled at B

, its area $= \frac{1}{2} \times AB \times BC = \frac{1}{2} \times 2\sqrt{10} \times \sqrt{10}$

$= 10$ square units.

5

[a] Let D be the midpoint of $\overline{BC} = \left(\frac{3+1}{2}, \frac{7-3}{2}\right)$

$= (2, 2)$

$\therefore$ The slope of $\overleftrightarrow{AD} = \frac{2-6}{2-4} = 2$

$\therefore$ The equation of $\overleftrightarrow{AD}$ is : $y = 2x + c$

$, \because A \in \overleftrightarrow{AD}$

$\therefore (4, 6)$ satisfies the equation.

$\therefore 6 = 2 \times 4 + c \qquad \therefore c = -2$

$\therefore$ The equation of $\overleftrightarrow{AD}$ is : $y = 2x - 2$

[b] 1 $\because$ The diagonals of the parallelogram bisect each other

$\therefore M = \left(\frac{3+5}{2}, \frac{3-1}{2}\right) = (4, 1)$

2 Let D (x, y)

$\therefore (4, 1) = \left(\frac{2+x}{2}, \frac{-2+y}{2}\right)$

$\therefore \frac{2+x}{2} = 4 \qquad \therefore 2 + x = 8 \qquad \therefore x = 6$

$, \frac{-2+y}{2} = 1 \qquad \therefore -2 + y = 2 \qquad \therefore y = 4$

$\therefore D(6, 4)$

25 Matrouh

1

1 c 2 c 3 b 4 a 5 b 6 c

2

[a] $\because 4x = \cos^2 30° \tan^2 30° \tan^2 45°$

$\therefore 4x = \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{1}{\sqrt{3}}\right)^2 \times (1)^2$

$\therefore 4x = \frac{3}{4} \times \frac{1}{3} \times 1 \qquad \therefore 4x = \frac{1}{4}$

$\therefore x = \frac{1}{16}$

[b] 1 Let A (x, y)

$\therefore (5, 7) = \left(\frac{x+8}{2}, \frac{y+11}{2}\right)$

$\therefore \frac{x+8}{2} = 5 \qquad \therefore x + 8 = 10 \qquad \therefore x = 2$

$, \frac{y+11}{2} = 7 \qquad \therefore y + 11 = 14 \qquad \therefore y = 3$

$\therefore A(2, 3)$

2 $MB = \sqrt{(8-5)^2 + (11-7)^2} = \sqrt{9+16}$

$= 5$ length units.

3

[a] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{3-5}{3+2} = \frac{-2}{5}$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{2-3}{-4-3} = \frac{1}{7}$

$, \because m_1 \neq m_2 \quad \therefore$ A , B and C are not collinear

$, \because$ The slope of $\overleftrightarrow{CD} = m_3 = \frac{4-2}{-9+4} = \frac{-2}{5}$

, the slope of $\overleftrightarrow{AD} = m_4 = \frac{4-5}{-9+2} = \frac{1}{7}$

$, \because m_1 = m_3 \qquad \therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ (1)

$, \because m_2 = m_4 \qquad \therefore \overleftrightarrow{BC} \parallel \overleftrightarrow{AD}$ (2)

From (1) , (2) : $\therefore$ ABCD is a parallelogram.

[b] $\frac{\cos^2 60° + \cos^2 30° - \tan^2 45°}{\sin 60° \tan 60° - \sin 30°}$

$= \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 - (1)^2}{\frac{\sqrt{3}}{2} \times \sqrt{3} - \frac{1}{2}} = \frac{\frac{1}{4} + \frac{3}{4} - 1}{\frac{3}{2} - \frac{1}{2}} = 0$

4

[a] $\because$ The slope of the given straight line $= \frac{-5}{-2} = \frac{5}{2}$

$\therefore$ The slope of the required straight line $= \frac{-2}{5}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-2}{5}x + c$

$, \because (3, 4)$ satisfies the equation.

$\therefore 4 = \frac{-2}{5} \times 3 + c \qquad \therefore c = \frac{26}{5}$

$\therefore$ The equation is : $y = \frac{-2}{5}x + \frac{26}{5}$

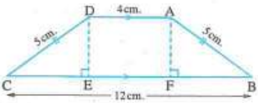
[b] Draw $\overline{AF} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

, $\because \overline{AD} \parallel \overline{BC}$

, $\overline{AF} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$



$\therefore$ AFED is a rectangle

$\therefore$ FE = AD = 4 cm.

$\therefore$ BF + CE = 8 cm.

, BF = CE = 4 cm. (Δ AFB $\equiv$ Δ DEC)

In Δ AFB : $\because$ m ($\angle$ AFB) = 90°

$\therefore (AF)^2 = (5)^2 - (4)^2 = 9$ $\qquad$ $\therefore$ AF = 3 cm.

$\therefore$ DE = AF = 3 cm. (ABCD is a rectangle)

$$\therefore \frac{5 \tan B \cos C}{\sin^2 C + \cos^2 C} = \frac{5 \times \frac{3}{4} \times \frac{4}{5}}{\left(\frac{3}{5}\right)^2 + \left(\frac{4}{5}\right)^2} = 3$$

5

[a] $m_1 = \frac{k-1}{2-3} = 1 - k$, $m_2 = \tan 45° = 1$

$\boxed{1}$ $\because L_1 \parallel L_2$ $\qquad$ $\therefore m_1 = m_2$

$\therefore 1 - k = 1$ $\qquad$ $\therefore k = 0$

$\boxed{2}$ $\because L_1 \perp L_2$ $\qquad$ $\therefore m_1 \times m_2 = -1$

$\therefore (1-k) \times 1 = -1$ $\quad$ $\therefore 1 - k = -1$ $\quad$ $\therefore k = 2$

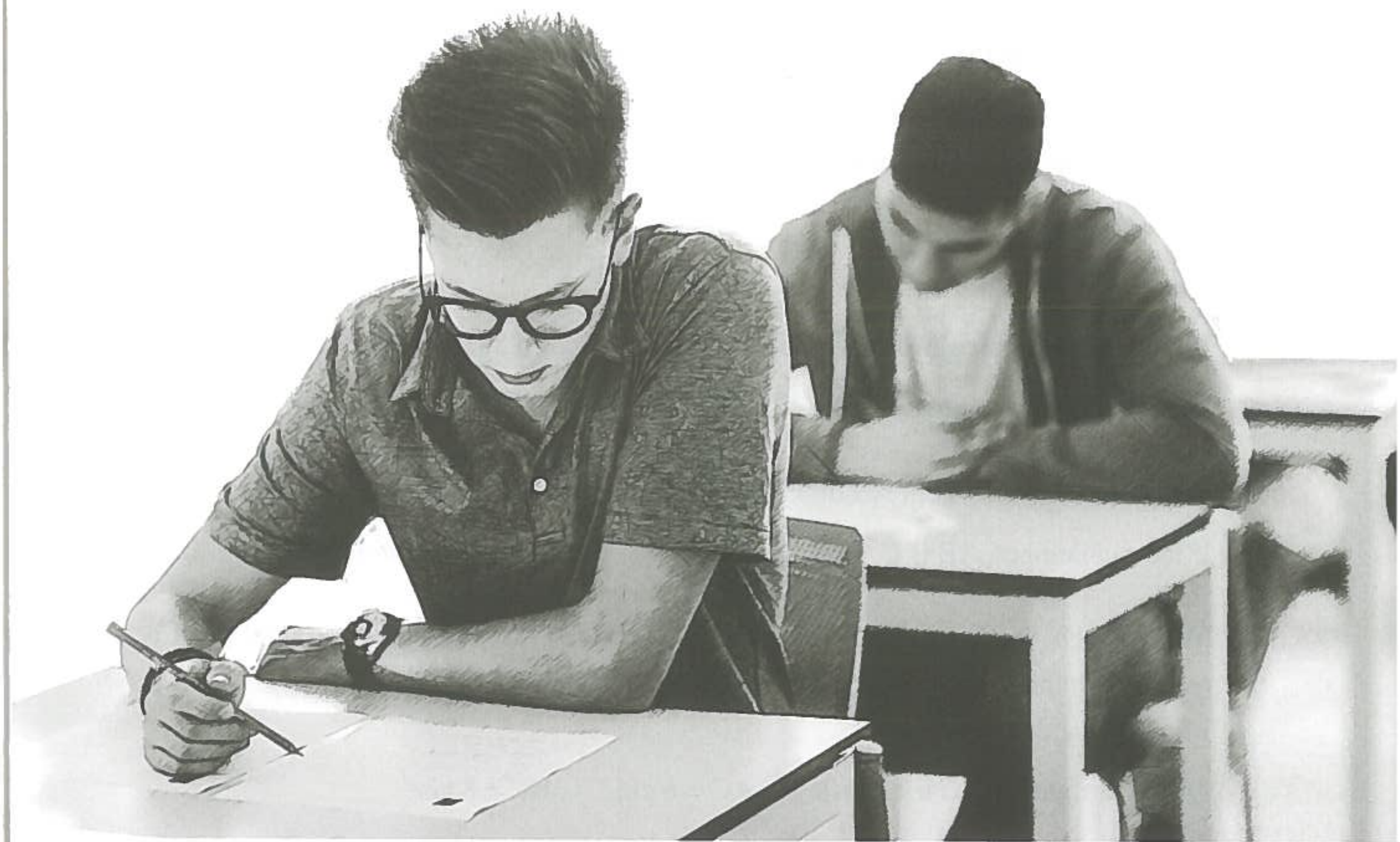
[b] $\because 2x = 3y + 6$ $\qquad$ $\therefore 3y = 2x - 6$

$\therefore y = \frac{2}{3}x - 2$ $\qquad$ $\therefore$ The slope $= \frac{2}{3}$

and the intercepted part = 2 units from the negative part of y-axis

Final Examinations 2020

on Trigonometry and Geometry



Model 1

Answer the following questions :

1 **Choose the correct answer from those given :**

1. $\tan 45° = ...$

   (a) 1 (b) $2\sqrt{2}$ (c) $\frac{1}{2}$ (d) $\sqrt{2}$

2. If $\sin X = \frac{1}{2}$, X is an acute angle , then $m(\angle X) = ...$

   (a) 45° (b) 60° (c) 30° (d) 90°

3. The distance between the two points (3 , 0) and (0 , – 4) equals .... length units.

   (a) 4 (b) 5 (c) 6 (d) 7

4. If $x + y = 5$, $k x + 2 y = 0$ are perpendicular , then k = ...

   (a) – 2 (b) – 1 (c) 1 (d) 2

5. If A (5 , 7) , B (1 , – 1) , then the midpoint of $\overline{AB}$ is ....

   (a) (2 , 3) (b) (3 , 3) (c) (3 , 2) (d) (3 , 4)

6. The equation of the straight line which passes through the point (3 , – 5) and parallel to y-axis is ....

   (a) $x = 3$ (b) $y = -5$ (c) $y = 2$ (d) $x = -5$

2 **[a] Without using calculator , prove that :** $\sin 60° = 2 \sin 30° \cos 30°$

[b] Prove that : The points A (– 3 , – 1) , B (6 , 5) and C (3 , 3) are collinear.

3 **[a]** If $4 \cos 60° \sin 30° = \tan x$, find the value of x , where x is an acute angle.

[b] If the midpoint of $\overline{AB}$ is C (6 , – 4) where A (5 , – 3) , **find the point :** B

4 **[a]** If the straight line L_1 passes through the points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the x-axis an angle of measure 45° , find the value of k if $L_1 // L_2$

[b] ABC is a right-angled triangle at C , AC = 6 cm. , BC = 8 cm.

Find : 1. $\cos A \cos B - \sin A \sin B$

2. $m(\angle B)$

5 **[a]** Find the equation of the straight line whose slope is 2 and passes through the point (1 , 0)

[b] **Prove that :** The points A (3 , – 1) , B (– 4 , 6) and C (2 , – 2) which belongs to an orthogonal Cartesian coordinates plane lie on the circle whose centre is M (– 1 , 2) Find the circumference of the circle.

Model 2

Answer the following questions :

1 **Choose the correct answer from those given :**

1. $2 \sin 30° \tan 60° =$ ....

   (a) $\sqrt{3}$ (b) 3 (c) $\frac{\sqrt{3}}{3}$ (d) $\frac{1}{2}$

2. The equation of the straight line which passes through the point (– 2 , – 3) and parallel to x-axis is ....

   (a) $x = -2$ (b) $x = -3$ (c) $y = -2$ (d) $y = -3$

3. If $\cos x = \frac{\sqrt{3}}{2}$, x is an acute angle , then $\sin 2x =$ ....

   (a) 1 (b) $\frac{\sqrt{3}}{2}$ (c) – 2 (d) $\frac{1}{\sqrt{3}}$

4. A circle of centre at the origin point and its radius length is 2 length units , which of the following points belongs to the circle ?

   (a) (1 , – 2) (b) $\left(-2 , \sqrt{5}\right)$ (c) $\left(\sqrt{3} , 1\right)$ (d) (0 , 1)

5. The perpendicular distance between the two straight lines : $x - 2 = 0$, $x + 3 = 0$ equals .... length units.

   (a) 1 (b) 5 (c) 2 (d) 3

6. If $\frac{-3}{2}$, $\frac{6}{k}$ are the slopes of two parallel straight lines , then k = ...

   (a) 6 (b) – 4 (c) $\frac{3}{2}$ (d) 2

2 **[a]** If $\cos E \tan 30° = \cos^2 45°$, find m (∠ E) , E is an acute angle.

[b] Show the type of the triangle whose vertices are A (3 , 3) , B (1 , 5) and C (1 , 3) due to its side lengths.

3 **[a]** Find the equation of the straight line which passes through the points (1 , 3) and (– 1 , – 3) and prove that it is passing through the origin point.

[b] If the point (3 , 1) is the midpoint of (1 , y) , (x , 3) , find the point (x , y)

4 [a] Find the equation of the straight line which intercepts the two axes two positive parts of lengths 1 and 4 for x and y axes respectively and find its slope.

[b] ABC is a right-angled triangle at B , AC = 10 cm. and BC = 8 cm.
Prove that : $\sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

5 [a] **Prove that :** The straight line which passes through the points $(-1, 3)$, $(2, 4)$ is parallel to the straight line : $3y - x - 1 = 0$

[b] ABCD is a trapezium , $\overline{AD} // \overline{BC}$, $m(\angle B) = 90°$, AB = 3 cm. , BC = 6 cm. and AD = 2 cm.
Find the length of $\overline{DC}$ and the value of $\cos(\angle BCD)$

Model for the merge students

Answer the following questions :

1 **Put (✓) or (✗) :**

1. The distance between the points (9 , 0) , (4 , 0) equals 5 length units. ( )
2. If tan E = 1 , then m (∠ E) = 45° ( )
3. The straight line $y = 2X + 1$ intercepts a part of length – 1 from y-axis ( )
4. If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$, then the slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{CD}$ = 1 (both of $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ aren't parallel to any axis) ( )
5. $\tan 60° = \frac{1}{\sqrt{3}}$ ( )
6. If A (1 , 2) , B (3 , 4) , then the midpoint of $\overline{AB}$ is (2 , 3) ( )

2 **Choose the correct answer from those given :**

1. The distance between the point (4 , 3) and X-axis is .... length units.
   (a) – 3 (b) 3 (c) 4 (d) – 4
2. 4 cos 30° tan 60° = ...
   (a) 3 (b) $2\sqrt{3}$ (c) 6 (d) 12
3. If $X + y = 5$, $kX + 2y = 0$ are parallel , then k = ...
   (a) – 2 (b) – 1 (c) 1 (d) 2
4. The points (0 , 1) , (3 , 0) and (0 , 4) ....
   (a) form a right-angled triangle. (b) form an acute-angled triangle.
   (c) form an obtuse-angled triangle. (d) are collinear.
5. If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{2}{3}$, then the slope of $\overleftrightarrow{CD}$ = ...
   (a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{-2}{3}$ (d) $\frac{-3}{2}$
6. If $\sin X = \frac{1}{2}$, X is an acute angle , then $\sin 2X$ = ...
   (a) 1 (b) $\frac{1}{4}$ (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{3}}$

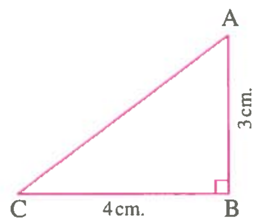
3 Join from column (A) to column (B) :

(A)	(B)
1 The slope of the straight line which is parallel to X-axis is	• 10
2 $\sin^2 30° + \cos^2 30° =$	• 0
3 If ABCD is a rectangle where A (– 1 , – 4) , C (5 , 4) , then the length of $\overline{BD}$ = ... length units.	• 1
4 The equation of the straight line which passes through the origin point and its slope is 2 is y = ... X	• – 3
5 The equation of the straight line which passes through the point (2 , – 3) and parallel to X-axis is y = ...	• 2
6 The value of : $\frac{2 \tan 30°}{1 + \tan^2 30°}$ = ...	• $\frac{\sqrt{3}}{2}$

4 Complete the following :

1 If $\overline{AB}$ // $\overline{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{1}{2}$, then the slope of $\overleftrightarrow{CD}$ = ...

2 **In the opposite figure :**



ABC is a right-angled triangle at B

, AB = 3 cm. and BC = 4 cm.

, then sin C = ...

3 If the point (0 , a) belongs to the straight line : $3X - 4y = -12$, then a = ...

4 If $X \cos 60° = \tan 45°$, then X = ...

5 The distance between the point (4 , 3) and the origin point in the coordinates plane is ....

6 If the origin point is the midpoint of $\overline{AB}$ where A (5 , – 2)

, then B (............... , ...)

1 Cairo Governorate

Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer from those given :

1 If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{1}{2}$, then the slope of $\overleftrightarrow{CD}$ = ...

(a) 2 (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) – 2

2 The number of symmetry axes of an isosceles triangle equals ....

(a) 1 (b) 2 (c) 3 (d) 4

3 tan 60° tan 30° = ...

(a) sin 30° (b) tan 30° (c) tan 45° (d) cos 60°

4 The sum of the measures of the interior angles of the quadrilateral equals ....

(a) 540° (b) 360° (c) 180° (d) 90°

5 The equation of the straight line which passes through the point (2 , 3) and is parallel to X-axis is ....

(a) $X = 2$ (b) $X = 3$ (c) y = 2 (d) y = 3

6 The perimeter of the square whose surface area is 100 cm^2 equals .... cm.

(a) 10 (b) 20 (c) 40 (d) 50

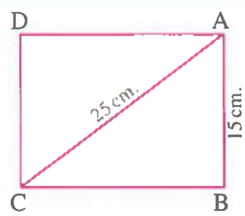
2 **[a]** If $X \sin 45° \cos 45° = \sin 30°$, find the value of X (Showing the steps of the solution).

[b] Find the equation of the straight line which its slope is 2 and passes through the point (1 , 0)

3 **[a]** XYZ is a right-angled triangle at Y in which XY = 6 cm. , YZ = 8 cm.
Find the value of : cos X cos Z – sin X sin Z

[b] ABCD is a quadrilateral , where A (2 , 4) , B (– 3 , 0) , C (– 7 , 5) , D (– 2 , 9)
Prove that : The figure ABCD is a square.

4 **[a] In the opposite figure :**



ABCD is a rectangle , AB = 15 cm.
, AC = 25 cm.

Find : 1 The length of $\overline{BC}$ 2 m (∠ ACB)

3 The area of the rectangle ABCD

[b] If C (6 , – 4) is the midpoint of $\overline{AB}$ where A (5 , – 3) , find the coordinates of the point B

5 [a] If the straight line whose equation is $a\,X + 2\,y - 7 = 0$ is parallel to the straight line which makes an angle of measure 45° with the positive direction of X-axis , find the value of a

[b] Find the equation of the straight line which passes through the two points (4 , 2) , (– 2 , – 1) , then prove that it passes through the origin point.

2 Giza Governorate

Answer the following questions :

1 **Choose the correct answer :**

1 If $\sin X = \frac{1}{2}$ where X is an acute angle , then $\sin 2X =$ ....

(a) $\frac{1}{4}$ (b) 1 (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{\sqrt{3}}{2}$

2 The distance between the point (4 , 3) and y-axis equals .... length unit.

(a) – 3 (b) – 4 (c) 3 (d) 4

3 The points (8 , 0) , (0 , 6) , (0 , 0) ....

(a) form a right-angled triangle. (b) form an obtuse-angled triangle.

(c) form an acute-angled triangle. (d) are collinear.

4 If A (5 , 7) , B (1 , – 1) , then the midpoint of $\overline{AB}$ is ....

(a) (2 , 3) (b) (3 , 3) (c) (3 , 2) (d) (3 , 4)

5 The equation of the straight line which passes through the point (1 , – 3) and is parallel to X-axis is ....

(a) $X = 3$ (b) $y = 1$ (c) $y = -3$ (d) $X = -3$

6 The opposite figure represents a quarter of a circle with radius 2 cm. long , then its perimeter = ... cm.


2 cm.

(a) 2π (b) 5π

(c) $\pi + 4$ (d) $4\pi + 4$

2 [a] Find the equation of the straight line which its slope is 2 and passes through the point (1 , – 1)

[b] ABC is a right-angled triangle at C in which AC = 3 cm. , BC = 4 cm. **Find :**

1 $\cos A \cos B - \sin A \sin B$ 2 m (∠ B)

3 [a] **Without using calculator , prove that :** $\sin 60° = 2 \sin 30° \cos 30°$

[b] If the straight line L_1 passes through the two points (3 , 1) , (2 , k) and the straight line L_2 makes with the positive direction of the X-axis an angle of measure 45° , find the value of k if $L_1 \perp L_2$

4 **[a]** If $\cos E \tan 30° = \cos^2 45°$, then find m ($\angle$ E) where E is an acute angle.

[b] Show the type of the triangle whose vertices are the points :
A (3 , 3) , B (1 , 5) , C (1 , 3) with respect to its side lengths.

5 **[a]** Find the slope of the straight line $5X + 4y + 10 = 0$, then find the length of the y-intercept.

[b] Prove that the points A (3 , – 1) , B (– 4 , 6) , C (2 , – 2) which belong to a perpendicular coordinates plane passing through the circle whose centre is the point M (– 1 , 2) , then find the area of the circle.

3 Alexandria Governorate

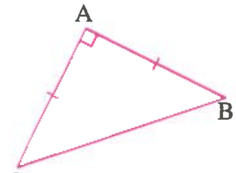
Answer the following questions : ***(Calculators are permitted)***

1 **Choose the correct answer from those given :**

1. If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{2}{3}$, then the slope of $\overleftrightarrow{CD} =$ ....

(a) $\frac{3}{2}$ (b) $\frac{2}{3}$ (c) $\frac{-3}{2}$ (d) $\frac{-2}{3}$

2. **In the opposite figure :**



ABC is an isosceles triangle and a right-angled triangle at A , then tan C = ...

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{\sqrt{3}}$ (c) 1 (d) $\frac{1}{2}$

3. If A , B are two acute angles and m ($\angle$ A) + m ($\angle$ B) = 90° , m ($\angle$ A) $\neq$ m ($\angle$ B) , then ....

(a) sin A = cos B (b) sin A = sin B
(c) tan A = tan B (d) cos A = cos B

4. A circle of centre at the origin point and its radius length is 2 length unit , then the point .... belongs to it.

(a) (1 , – 2) (b) $\left(-2 , \sqrt{5}\right)$ (c) (0 , 1) (d) $\left(\sqrt{3} , 1\right)$

5. If X , Y are two supplementary angles and m ($\angle$ X) = m ($\angle$ Y) , then m ($\angle$ X) = ...°

(a) 30 (b) 45 (c) 60 (d) 90

6. The parallelogram whose diagonals are equal in length and perpendicular is the ....

(a) square. (b) rhombus. (c) rectangle. (d) trapezium.

2 **[a] Find the value of X which satisfies :** $X \sin 30° \cos^2 45° = \sin^2 60°$

[b] ABCD is a parallelogram where A (3 , 2) , B (4 , – 5) , C (0 , – 3) Find the two coordinates of the point at which the two diagonals intersect , then find the coordinates of the point D

3 **[a]** Prove that the points A (3 , – 1) , B (– 4 , 6) and C (2 , – 2) are located on a circle whose centre is the point M (– 1 , 2) , then find the circumference of the circle. ($\pi = 3.14$)

[b] Find the equation of the straight line which is perpendicular to the straight line whose equation is $X + 2y + 5 = 0$ and intercepts a positive part from y-axis that is equal to 7 units.

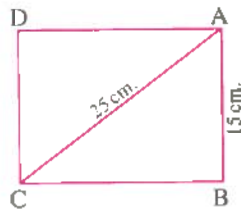
4 **[a]** Prove that the straight line passing through the two points (– 3 , – 2) , (4 , 5) is parallel to the straight line that makes with the positive direction of the X-axis an angle of measure 45°

[b] ABC is a right-angled triangle at C , AC = 6 cm. , BC = 8 cm.

Find the value of : cos A cos B – sin A sin B

5 **[a]** Let A (4 , – 6) , B (3 , 7) and C (1 , – 3) Find the equation of the straight line which passes through A and the midpoint of $\overline{BC}$

[b] In the opposite figure :



ABCD is a rectangle where AB = 15 cm.

, AC = 25 cm.

Find : 1 m (∠ ACB)

2 The surface area of the rectangle ABCD

4 El-Kalyoubia Governorate

Answer the following questions :

1 **Choose the correct answer :**

1 If $\cos \frac{X}{2} = \frac{1}{2}$ where $\frac{X}{2}$ is the measure of a positive acute angle , then $X =$ ....°

(a) 30 (b) 90 (c) 60 (d) 120

2 The triangle whose area is 24 cm^2 and its height is 8 cm. , then the length of the base corresponding to this height is .... cm.

(a) 16 (b) 6 (c) 3 (d) 2

3 If $\overleftrightarrow{CD}$ is parallel to y-axis where C (k , 4) , D (– 5 , 7) , then k = ...

(a) 5 (b) 7 (c) – 5 (d) 4

4 The equation of the straight line passing through the origin point and its slope = 1 is ....

(a) $y = x$ (b) $y = -x$ (c) $y = 2x$ (d) $y = 0$

5 If the point (0 , a) belongs to the straight line $3x - 4y + 12 = 0$, then a = ...

(a) 4 (b) – 3 (c) 3 (d) – 4

6 In Δ ABC , if $(AB)^2 > (BC)^2 + (AC)^2$, then $\angle$ C is .... angle.

(a) an acute (b) a right (c) an obtuse (d) a straight

2 [a] If the distance of the point (x , 5) from the point (6 , 1) equals $2\sqrt{5}$ length unit , then find the value of x

[b] **Without using the calculator , find the numerical value of the expression :**
$\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$

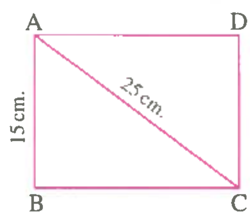
3 [a] ABCD is a parallelogram where A (3 , 2) , B (4 , – 5) , C (0 , – 3)
Find the two coordinates of the point at which the two diagonals intersect , then find the coordinates of the point D

[b] ABC is a right-angled triangle at B in which AC = 10 cm. , BC = 8 cm.
Prove that : $\sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

4 [a] If the straight line L_1 passes through the two points (3 , 1) and (2 , k) and the straight line L_2 makes with the positive direction of the x-axis an angle of measure 45° , then find k if $L_1 // L_2$

[b] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line $x + 3y + 7 = 0$

5 [a] **In the opposite figure :**



ABCD is a rectangle in which
AB = 15 cm. and AC = 25 cm.

Find : 1 m ($\angle$ ACB)

2 The surface area of the rectangle ABCD

[b] Find the equation of the straight line which intersects from the x and y axes two positive parts whose lengths are 4 and 9 length units respectively.

5 El-Sharkia Governorate

Answer the following questions : ***(Calculator is allowed)***

1 Choose the correct answer from those given :

1. If $\cos(X + 25°) = \frac{1}{2}$, X is the measure of an acute angle , then $X =$ ....°
   (a) 20 (b) 35 (c) zero (d) 5
2. The straight line whose equation is $3y = 2X - 6$, its slope = ...
   (a) 2 (b) $\frac{2}{3}$ (c) 6 (d) $\frac{3}{2}$
3. The equation of the straight line which passes through the origin point and makes with the positive direction of X-axis an angle of measure 60° is ....
   (a) $X = 3y$ (b) $y = \sqrt{3}X + 2$ (c) $y = 3X$ (d) $y = \sqrt{3}X$
4. If ABC is a right-angled triangle at B and $\sin A = \frac{2}{7}$, then $\cos C =$ ....
   (a) $\frac{2}{7}$ (b) $\frac{3}{7}$ (c) $\frac{4}{7}$ (d) $\frac{5}{7}$
5. The distance between the point $A(\sqrt{2}, 4)$ and the origin point equals .... length unit.
   (a) $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $3\sqrt{2}$ (d) $4\sqrt{2}$
6. If the slope of the straight line L_1 is $\frac{a}{5}$ and the slope of the straight line L_2 is $\frac{-b}{3}$ where $a , b \neq 0$ and $L_1 \perp L_2$, then $ab =$ ....
   (a) $\frac{3}{5}$ (b) $\frac{-3}{5}$ (c) 15 (d) – 15

2

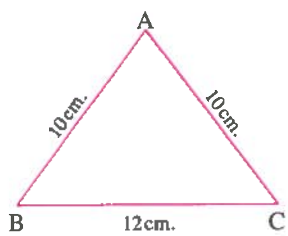
[a] Without using the calculator , prove that : $\frac{\sin 30° \sin 60°}{\sin 45° \cos 45°} = \cos 30°$

[b] Prove that the points A (3 , – 1) , B (– 4 , 6) , C (2 , – 2) which belong to an orthogonal Cartesian coordinates plane lie on the circle whose centre is M (– 1 , 2) , then find the circumference of the circle.

3

[a] If A (5 , 1) , B (3 , – 7) , C (1 , 3) are three noncollinear points , find the equation of the straight line which passes through the point A and is parallel to $\overleftrightarrow{BC}$

[b] In the opposite figure :



ABC is an isosceles triangle where

AB = AC = 10 cm. , BC = 12 cm.

Find : 1 sin B

2 The area of the triangle ABC

4 **[a]** If ABCD is a parallelogram , A (3 , 3) , B (2 , – 2) , C (5 , – 1)

, **find :** 1 The coordinates of the point of intersection of the two diagonals.

2 The coordinates of the point D

[b] Find the equation of the straight line which passes through the two points (4 , 5) , (0 , 3) , then find the coordinates of the intersection point of the straight line with x-axis.

5 **[a]** If $\cos x = \sin 30° \cos 60°$

, **find :** 1 The measure of angle x (where x is an acute angle).

2 $\tan x$

[b] Find the equation of the straight line which cuts 3 units from the positive part of y-axis and is perpendicular to the straight line $\frac{x}{2} + \frac{y}{3} = 1$

6 El-Monofia Governorate

Answer the following questions : ***(Using calculator is permitted)***

1 **Choose the correct answer :**

1 If $\cos (x + 15)° = \frac{1}{2}$, then $\sin (75 - x)° =$ ....

(a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) 1

2 A circle is drawn inside a square where the circle touches its four sides. If the perimeter of the square is 56 cm. , then the surface area of the circle is .... cm^2.

(a) $\frac{77}{2}$ (b) 77 (c) 112 (d) 154

3 The number of sides of the regular polygon in which the measure of one of its interior angles is 144° equals .... sides.

(a) 7 (b) 8 (c) 9 (d) 10

4 An isosceles triangle , the lengths of its sides may be 4 cm. , 9 cm. , ... cm.

(a) 4 (b) 9 (c) 13 (d) 36

5 The distance between the point (– 2 , – 3) and x-axis equals .... length units.

(a) 2 (b) 3 (c) – 2 (d) – 3

6 The equation of the straight line which its slope = $\frac{1}{2}$ and cuts the y-axis at the point (0 , 3) is ....

(a) $2y = \frac{1}{2}x + 6$ (b) $y = \frac{1}{2}x$

(c) $y = \frac{1}{2}x + 3$ (d) $2y = \frac{1}{2}x + 3$

2 **[a] Without using calculator , find the numerical value of the expression :**

$\sin 30° \cos 60° + \cos 30° \sin 60° - \tan^2 45°$

[b] $\overline{AB}$ is a diameter in circle M , if A (7 , – 3) and B (5 , 1) where $\pi = 3.14$, **find :**

1 The surface area of the circle.

2 The coordinates of the centre of circle M

3 **[a]** ABC is a right-angled triangle at A , AB = 5 cm. and BC = 13 cm.

Find the numerical value of the expression : sin C cos B + cos C sin B

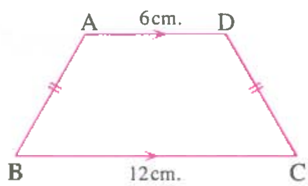
[b] Find the equation of the straight line which passes through the point (1 , 3) and is perpendicular to the straight line passing through the two points (5 , 0) and (2 , 1)

4 **[a] In the opposite figure :**

ABCD is an isosceles trapezium , its area = 36 $cm.^2$

, $\overline{AD}$ // $\overline{BC}$, AD = 6 cm. and BC = 12 cm.

Find the value of : sin B + cos C



[b] Show the type of the triangle ABC according to its angles measures if its vertices are A (– 1 , 3) , B (5 , 1) and C (6 , 4)

5 **[a]** Find the slope of the straight line and the length of the intercepted part from y-axis where its equation is $4x + 5y - 10 = 0$

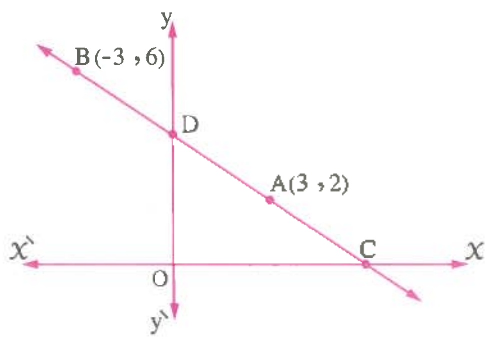
[b] In the opposite figure :

$\overleftrightarrow{CD}$ passes through the two points A (3 , 2) , B (– 3 , 6) and cuts the two axes at C and D respectively.

Find with the proof :

1 The equation of $\overleftrightarrow{CD}$

2 The area of the triangle DOC where O is the origin point.



7 El-Gharbia Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer :**

1 The perpendicular distance between the two straight lines y – 4 = 0 and y + 5 = 0 equals .... length units.

(a) 1 (b) 5 (c) 9 (d) 4

2 The equation of the straight line passing through the point $(3 , -2)$ and parallel to X-axis is ....

(a) $X = 3$ (b) $y = 2$ (c) $y = -2$ (d) $X + y = 1$

3 If the straight line whose equation is $y = k X + 1$ is parallel to the straight line whose equation is $2y - X = 0$, then $k =$ ....

(a) 1 (b) $\frac{1}{2}$ (c) 2 (d) -2

4 If the lengths 3 , 7 , ℓ are lengths of sides of a triangle , then ℓ can be equal to ....

(a) 3 (b) 7 (c) 4 (d) 10

5 The image of the point $(-3 , 5)$ by reflection on the y-axis is ....

(a) $(3 , 5)$ (b) $(5 , 3)$ (c) $(-5 , 3)$ (d) $(-3 , -5)$

6 If ABC is a right-angled triangle at B , then $\frac{\sin A}{\cos C} =$ ....

(a) $\frac{3}{5}$ (b) $\frac{4}{3}$ (c) $\frac{3}{4}$ (d) 1

2 **[a]** If $\tan X = 4 \cos 60° \sin 30°$, then find the value of X where X is the measure of an acute angle.

[b] If the triangle XYZ whose vertices are X $(3 , 5)$, Y $(4 , 2)$, Z $(-5 , a)$ is a right-angled triangle at Y

, **find :** 1 The value of a

2 The surface area of the triangle XYZ

3 **[a]** If the ratio between the two measures of two supplementary angles is 3 : 5

, find the degree measure for each of them by degrees and minutes.

[b] Find the equation of the straight line passing through the point $(-1 , 2)$ and perpendicular to the straight line $X + y = 5$

4 **[a]** Prove that the points A $(3 , -1)$, B $(-4 , 6)$, C $(2 , -2)$ which belong to an orthogonal Cartesian coordinates plane lie on one circle whose centre is the point M $(-1 , 2)$, then find the circumference in terms of π

[b] ABCD is a trapezium in which $\overline{AD} // \overline{BC}$, m $(\angle B) = 90°$, AB = 3 cm.

, AD = 6 cm. , BC = 10 cm. **Find the value of :** $\cos(\angle DCB) - \tan(\angle ACB)$

5 **[a]** ABCD is a parallelogram in which A $(3 , 2)$, B $(4 , -5)$, C $(0 , -3)$

Find : 1 The coordinates of the intersection point of the two diagonals.

2 The coordinates of the vertex point D

[b] In the opposite figure :

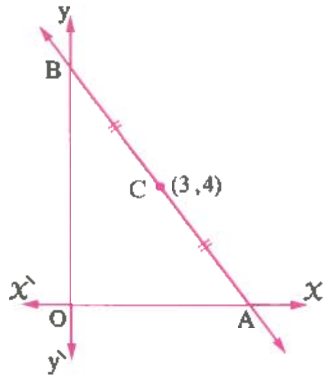
The point C is the midpoint of $\overline{AB}$

where C (3 , 4) , O is the origin point

in the perpendicular coordinate system.

Find : 1 The coordinates of the two points A and B

2 The equation of $\overleftrightarrow{AB}$



8 El-Dakahlia Governorate

Answer the following questions : ***(Calculator is permitted)***

1 **[a] Choose the correct answer from those given :**

1 ABC is a triangle , m (∠ A) = 85° , sin B = cos B , then m (∠ C) = ...

(a) 30° (b) 45° (c) 50° (d) 60°

2 The area of the triangle bounded by the straight lines $X = 0$, $y = 0$, $3X + 2y = 12$ equals .... square units.

(a) 6 (b) 12 (c) 4 (d) 5

3 If the straight line passing through the two points (1 , y) , (3 , 4) its slope equals tan 45° , then y = ...

(a) 1 (b) 2 (c) – 1 (d) 4

[b] ABCD is an isosceles trapezium such that $\overline{AD}$ // $\overline{BC}$, AD = 4 cm. , AB = 5 cm. , BC = 12 cm. **Find the value of :** $\frac{\tan B \times \cos C}{\sin^2 C + \cos^2 B}$

2 **[a] Choose the correct answer from those given :**

1 The straight line $a X + (2 - a) y = 5$ is parallel to the straight line passing through the two points (1 , 4) , (3 , 5) , then a = ...

(a) 3 (b) – 2 (c) 6 (d) 4

2 ABC is a triangle , 2 m (∠ C) = m (∠ A) + m (∠ B) , then m (∠ C) = ...°

(a) 30 (b) 60 (c) 45 (d) 90

3 The straight line $\frac{X}{2} - \frac{y}{3} = 6$ cuts the X-axis at a part with length .... units.

(a) 3 (b) 2 (c) 6 (d) 12

[b] $\overline{AB}$ is a diameter of circle M , B (8 , 11) , M (5 , 7) **Find :**

1 The circumference of the circle.

2 The equation of the straight line perpendicular to $\overline{AB}$ from point A

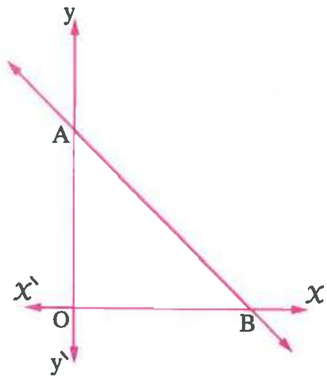
3 **[a] Prove that the quadrilateral ABCD whose vertices are :**

A (– 1 , 3) , B (5 , 1) , C (7 , 4) , D (1 , 6) is a parallelogram.

[b] The opposite figure represents the straight line $\overleftrightarrow{AB}$ whose equation is $y = k\,x + c$ and cuts the two axes with two equal parts and passes through the point (2 , 3) **Find :**

1 The values of k , c

2 The area of the triangle ABO



4 **[a] In the opposite figure :**

The straight line $\overleftrightarrow{AB}$ is parallel to y-axis.

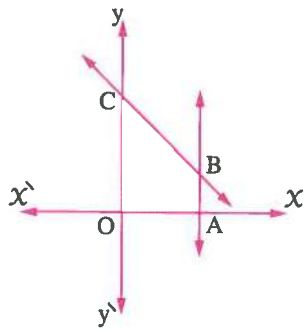
The straight line $\overleftrightarrow{BC}$ its equation is $y = -x + 3$

, the point B (2 , 1) **Find :**

1 The length of $\overline{BC}$

2 The area of the figure OABC

3 m ($\angle$ OCB)



[b] ABC is a right-angled triangle at B

1 **Prove that :** $\sin^2 A + \cos^2 A = 1$

2 If AB = 5 cm. , AC = 13 cm. , **find :** m ($\angle$ C) to the nearest minute.

5 **[a]** Find the equation of the straight line passing through the point (3 , 4) and makes with the positive direction of x-axis an angle of measure 135°

[b] Without using calculator , prove that :

$\tan^2 60° - \tan^2 45° = \sin^2 60° + \cos^2 60° + 2 \sin 30°$

9 Ismailia Governorate

Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer from those given :

1 The number of axes of symmetry of the scalene triangle equals ....

(a) zero (b) 1 (c) 2 (d) 3

2 The midpoint of $\overline{AB}$ where A (6 , 0) , B (0 , 4) is ....

(a) (6 , 4) (b) (4 , 6) (c) (3 , 2) (d) (2 , 3)

3 If the lengths of two sides of a triangle are 3 cm. and 4 cm. , then the length of the third side may be .... cm.

(a) 1 (b) 6 (c) 7 (d) 8

4 If $\tan 2X = \frac{1}{\sqrt{3}}$ where $2X$ is the measure of an acute angle , then $X =$ .... °

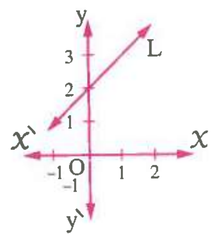
(a) 15 (b) 30 (c) 45 (d) 60

5 When you stand in front of the mirror and see your image , this is called in mathematics ....

(a) rotation. (b) translation. (c) reflection. (d) similarity.

6 **In the opposite figure :**

Which of the following represents the equation of the straight line L ?



(a) $y = X$

(b) $y = 2$

(c) $y + X = 2$

(d) $y - X = 2$

2 [a] **Without using the calculator , find the value of X if :**

$X \cos^2 30° = \tan^2 60° \cos^2 45°$

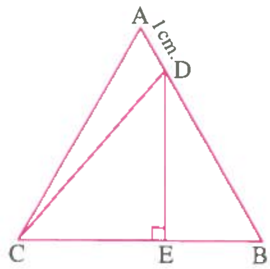
[b] If A (5 , – 1) , B (3 , 7) , C (1 , – 3) , find the equation of the straight line which passes through the midpoint of $\overline{BC}$ and the point A

3 [a] Prove that the points A (1 , – 2) , B (– 4 , 2) , C (1 , 6) are the vertices of an isosceles triangle.

[b] ABC is a right-angled triangle at B , find the value of : $\frac{\sin A}{\cos C}$ and if $\tan D = \frac{\sin A}{\cos C}$ where D is an acute angle , **find :** m (∠ D)

4 **[a]** If the straight line L_1 passes through the two points (k , 1) , (2 , 4) and the straight line L_2 makes with the positive direction of X-axis an angle of measure 45°
, find the value of k if the two straight lines are parallel.

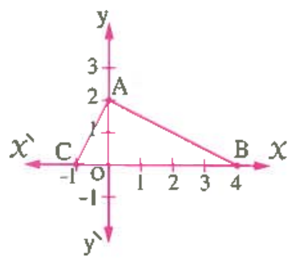
[b] In the opposite figure :



ABC is an equilateral triangle of side length 5 cm.
, D $\in \overline{AB}$ where AD = 1 cm. , $\overline{DE} \perp \overline{BC}$
Find : tan (∠ DCE)

5 **[a]** If ABCD is a rhombus where A (3 , 3) , C (– 3 , – 3)
, **find :** 1 The intersection point of the diagonals.
2 The equation of $\overleftrightarrow{BD}$

[b] In the opposite figure :



A triangle ABC is drawn in the orthogonal Cartesian coordinates plane.
Prove that : Δ ABC is a right-angled triangle and find its area.

10 Suez Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer from those given :**

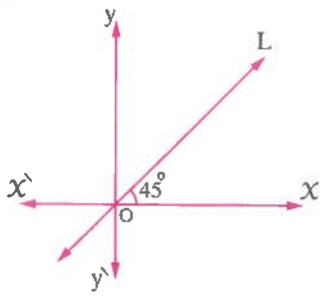
1 $\sin^2 60° + \cos^2 60° =$ ....

(a) 0 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) 1

2 ABCD is a parallelogram in which m (∠ A) + m (∠ C) = 200°
, then m (∠ B) = ... °

(a) 80 (b) 50 (c) 100 (d) 160

3 **In the figure opposite :**



The equation of the straight line L is ....

(a) $X = 1$
(b) $y = -X$
(c) $y = X$
(d) $y = 1$

4 If a , b are the measures of two complementary angles

where a : b = 1 : 2 , then b = ...°

(a) 180 (b) 90 (c) 30 (d) 60

5 The perpendicular distance between the straight lines

$x - 2 = 0$, $x + 3 = 0$ equals .... length units.

(a) 1 (b) 5 (c) 2 (d) 3

6 If A (0 , 0) , B (5 , 7) , C (5 , h) are the vertices of a right-angled triangle at C

, then h = ...

(a) 0 (b) 5 (c) 7 (d) – 5

2 [a] **Without using calculator , prove that :**

$2 \sin 30° + 4 \cos 60° = \tan^2 60°$

[b] If A (– 1 , – 1) , B (2 , 3) , C (6 , 0) , D (3 , – 4) are four points on an orthogonal Cartesian coordinates plane

, **prove that :** $\overline{AC}$ and $\overline{BD}$ bisect each other.

3 [a] If $\cos 3x = \frac{\sin 60° \sin 30°}{\tan 45° \sin^2 45°}$, find the value of x where $3x$ is an acute angle.

[b] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line passing through the two points A (2 , – 3) , B (5 , – 4)

4 [a] ABC is a right-angled triangle at C where AB = 5 cm. , BC = 4 cm.

Prove that : sin A cos B + cos A sin B = 1

[b] Find the equation of the straight line whose slope is equal to the slope of the straight line $\frac{y-1}{x} = \frac{1}{3}$ and intersects a part from the negative direction of y-axis of length 3 units.

5 [a] ABC is a triangle where A (0 , 0) , B (3 , 4) , C (– 4 , 3)

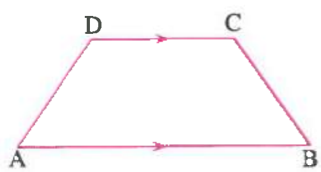
Find the perimeter of Δ ABC

[b] **In the opposite figure :**

ABCD is a trapezoid , $\overline{AB}$ // $\overline{CD}$

, A (9 , – 2) , B (3 , 2) , C ($-x$, $-x$) , D (4 , – 3)

Find the coordinates of the point C



11 Port Said Governorate

Answer the following questions :

1 Choose the correct answer from those given :

1 If $\frac{-2}{3}$, $\frac{k}{6}$ are the slopes of two perpendicular straight lines , then k = ...

(a) 9 (b) 4 (c) – 9 (d) – 4

2 The distance between the two points (15 , 0) , (6 , 0) equals .... unit length.

(a) – 9 (b) 9 (c) 3 (d) – 3

3 ABC is a right-angled triangle at C , AB = 25 cm. , AC = 15 cm.

, then the area of the surface of the triangle ABC is .... cm^2.

(a) 300 (b) 75 (c) 150 (d) 375

4 If $\overleftrightarrow{CD}$ is parallel to the y-axis where C (m , 4) , D (– 5 , 7) , then m = ...

(a) 5 (b) – 5 (c) – 7 (d) 7

5 If the point of the origin is the midpoint of $\overline{AB}$, where A (5 , – 2) , then the point B is ....

(a) (2 , 5) (b) (5 , – 2) (c) (– 2 , – 5) (d) (– 5 , 2)

6 If tan (x + 10) = $\sqrt{3}$ where x is the measure of an acute angle , then x = ...

(a) 40° (b) 50° (c) 60° (d) 70°

2 **[a]** Prove that the straight line which passes through the points (– 1 , 3) , (2 , 4) is parallel to the straight line 3 y – x – 1 = 0

[b] Without using calculator , prove that :

sin 90° = sin 60° cos 30° + cos 60° sin 30°

3 **[a]** If cos E = $\frac{\cos^2 45°}{\tan 30°}$, find m (∠ E) , E is an acute angle.

[b] Prove that the points A (– 3 , 0) , B (3 , 4) , C (1 , – 6) are the vertices of an isosceles triangle.

4 **[a]** Find the equation of the straight line whose slope is equal to the slope of the straight line $\frac{y-1}{x} = \frac{1}{3}$ and intercepts a negative part from the y-axis that is equal to 3 units.

[b] ABCD is a quadrilateral , where A (2 , 3) , B (6 , 2) , C (– 2 , – 2) , D (– 2 , 1)
Prove that the figure ABCD is a trapezoid.

5 **[a]** If A (5 , – 6) , B (3 , 7) and C (1 , – 3) , then find the equation of the straight line passing through the point A and the midpoint of $\overline{BC}$

[b] XYZ is a right-angled triangle at Y , where XY = 5 cm. , XZ = 13 cm.

, **find the value of :** sin X cos Z + cos X sin Z

12 Damietta Governorate

Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from the given answers :**

1. The complement of the angle whose measure is 40° is of measure ....

   (a) 50° (b) 80° (c) 90° (d) 140°

2. If D (6 , – 4) is the midpoint of $\overline{AB}$ where A (5 , – 3) , then B is ....

   (a) (– 5 , 7) (b) (5 , 7) (c) (7 , 5) (d) (7 , – 5)

3. The length of the radius of the circle of centre (0 , 0) and passes through (3 , 4) equals .... length units.

   (a) 7 (b) 1 (c) 12 (d) 5

4. The slope of the straight line $X - 5 = 0$ is ....

   (a) 5 (b) $\frac{1}{5}$ (c) undefined. (d) zero

5. If tan $(X + 10) = 1$, X is the measure of an acute angle , then $X =$ ....

   (a) 45° (b) 35° (c) 80° (d) 50°

6. The perpendicular distance between the two straight lines $X - 3 = 0$, $X + 4 = 0$ equals .... length units.

   (a) 1 (b) 5 (c) 2 (d) 7

2 **[a]** Find the equation of the straight line which passes through the points (5 , 0) , (0 , 5)

[b] ABC is a right-angled triangle at B where AB = 7 cm. , AC = 25 cm.

Find the value of the following : $\sin^2 A + \sin^2 C$

3 **[a]** If the points (0 , 1) , (a , 3) , (2 , 5) are located on one straight line

, then find the value of a

[b] Find the equation of the straight line passing through the point (3 , 7) and parallel to the straight line $X + 3y + 5 = 0$

4 **[a] Without using the calculator , find the value of X (Where X is the measure of an acute angle) which satisfies that :** $2 \sin X = \sin 30° \cos 60° + \cos 30° \sin 60°$

[b] Find the equation of the straight line whose slope is 2 and intersects a positive part from the y-axis that equals 7 units.

5 **[a] Prove the following equality :** $\tan 60° = \frac{2 \tan 30°}{1 - \tan^2 30°}$

[b] State the kind of the triangle whose vertices are the points A $(-2 , 4)$, B $(3 , -1)$, C $(4 , 5)$ with respect to its sides lenghts.

13 Kafr El-Sheikh Governorate

Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer :**

1. The measure of an exterior angle of the equilateral triangle equals ....
   (a) 60° (b) 150° (c) 120° (d) 30°
2. If $\frac{-2}{3}$, $\frac{6}{k}$ are the slopes of two perpendicular straight lines , then k = ...
   (a) 4 (b) -9 (c) -4 (d) 9
3. If ABCD is a square , then m ($\angle$ CAB) = ...
   (a) 90° (b) 45° (c) 60° (d) 630°
4. If $\sin \frac{X}{3} = \frac{1}{2}$, $\frac{X}{3}$ is the measure of an acute angle , then X = ...
   (a) 30° (b) 60° (c) 10° (d) 90°
5. The parallelogram whose two diagonals are equal in length and not perpendicular is called a ....
   (a) square. (b) rhombus. (c) rectangle. (d) trapezium.
6. The equation of the straight line which passes through the point $(2 , -3)$ and is parallel to X-axis is ....
   (a) $X = 2$ (b) $y = 3$ (c) $X = -2$ (d) $y = -3$

2 **[a]** Show the type of the triangle whose vertices are A $(3 , 0)$, B $(1 , 4)$, C $(-1 , 2)$ due to its side lengths.

[b] Without using calculator , find the value of the following :

$\sin^2 45° \cos 60° + \frac{1}{2} \tan 60° \sin 60°$

3 **[a]** If the straight line $L_1 : y = (2 - k) X + 5$ and the straight line L_2 makes with the positive direction of the X-axis an angle of measure 45°, find the value of k if $L_1 // L_2$

[b] If $\sqrt{3} \tan X = 4 \sin 60° \cos 30°$, **find :** X , where X is the measure of an acute angle.

4 **[a]** If the distance between the point $(X , 3)$ and the point $(2 , 5)$ equals $2\sqrt{2}$ length units , then find the values of X

[b] Find the equation of the straight line whose slope is 3 and passes through the point $(5 , -2)$

5 **[a]** If the midpoint of $\overline{BC}$ is $A (2 , 3)$, and $C (-1 , 3)$, find the point B

[b] ABC is a right-angled triangle at B , $\sin A + \cos C = 1$, **find :** $m (\angle A)$

14 El-Beheira Governorate

Answer the following questions : *(Calculator is permitted)*

1 **Choose the correct answer from the given ones :**

1 If the point of origin is the midpoint of $\overline{AB}$, where $A (5 , -2)$, then the point B is ....

(a) $(-5 , -2)$ (b) $(5 , 2)$ (c) $(-5 , 2)$ (d) $(0 , 0)$

2 The angle of measure 50° is complementary with an angle of measure ....

(a) 50° (b) 40° (c) 30° (d) 130°

3 A circle its centre is $(3 , -4)$ and its radius length is 5 units. Which of the following points belongs to the circle ?

(a) $(-3 , 4)$ (b) $(0 , 0)$ (c) $(5 , 0)$ (d) $(0 , 4)$

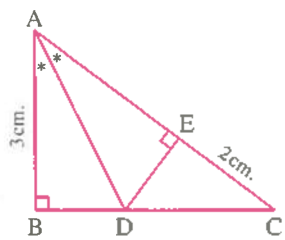
4 If $\cos \frac{X}{2} = \frac{1}{2}$ where $\frac{X}{2}$ is the measure of an acute angle , then $X =$ ....

(a) 60° (b) 120° (c) 180° (d) 90°

5 If ABCD is a parallelogram in which $m (\angle A) + m (\angle C) = 220°$, then $m (\angle B) =$ ....

(a) 110° (b) 70° (c) 140° (d) 80°

6 **In the figure opposite :**



ABC is a right-angled triangle at B

, $\overrightarrow{AD}$ bisects $\angle A$, $\overline{DE} \perp \overline{AC}$

, AB = 3 cm. , CE = 2 cm.

, then CB = ... cm.

(a) 2 (b) 3 (c) 4 (d) 5

2 **[a]** Prove that the straight line which passes through the two points $(-1, 3)$, $(2, 4)$ is parallel to the straight line $3y - x - 1 = 0$

[b] ABCD is a trapezium, $\overline{AD} \parallel \overline{BC}$, $m(\angle B) = 90^\circ$, $AB = 3$ cm., $BC = 6$ cm., $AD = 2$ cm. Find the length of $\overline{DC}$ and the value of $\cos(\angle BCD)$

3 **[a]** Find the equation of the straight line whose slope is 3 and passes through the point $(1, 2)$

[b] Without using the calculator, find the value of x (Where x is the measure of an acute angle) which satisfies that :

$2 \sin x = \tan^2 60^\circ - 2 \tan 45^\circ$

4 **[a]** If the straight line L_1 passes through the two points $(3, 1)$, $(2, k)$ and the straight line L_2 makes with the positive direction of the x-axis an angle of measure 45°, then find k if the two straight lines L_1, L_2 are perpendicular.

[b] ABC is a right-angled triangle at B, if $\sqrt{2}\, AB = AC$, find the main trigonometric ratios of the angle C

5 **[a]** If $A(x, 3)$, $B(3, 2)$, $C(5, 1)$ and $AB = BC$, $B \notin \overleftrightarrow{AC}$, then find the value of x

[b] Prove that the points $A(6, 0)$, $B(2, -4)$, $C(-4, 2)$ are the vertices of a right-angled triangle at B, then find the coordinates of the point D that makes the figure ABCD a rectangle.

15 El-Fayoum Governorate

Answer the following questions : ***(Using calculators is allowed)***

1 **Choose the correct answer :**

1. The perpendicular distance between the two straight lines $x - 2 = 0$ and $x + 3 = 0$ equals .... length units.

   (a) 1 (b) 5 (c) 2 (d) 3

2. The sum of the measures of the accumulative angles at a point is ....

   (a) 90° (b) 180° (c) 270° (d) 360°

3. If $\tan(x + 10) = \sqrt{3}$, where x is the measure of an acute angle, then $x =$ ....

   (a) 60° (b) 30° (c) 50° (d) 70°

4. The polygon in which the number of its sides is equal to the number of its diagonals is the ....

   (a) quadrilateral. (b) triangle. (c) pentagon. (d) hexagon.

5 A circle of centre at the origin point and its radius length is 2 length units. Which of the following points belongs to the circle ?

(a) $(1 , -2)$ (b) $\left(-2 , \sqrt{5}\right)$ (c) $\left(\sqrt{3} , 1\right)$ (d) $(0 , 1)$

6 The square which the length of its diagonal is $8\sqrt{2}$ cm. , its area equals .... cm^2.

(a) 4 (b) 32 (c) 64 (d) 16

2 [a] Prove that the points A $(3 , -1)$, B $(-4 , 6)$, C $(2 , -2)$ which belong to an orthogonal Cartesian coordinates plane lie on the circle whose centre is M $(-1 , 2)$, and find the circumference of the circle where $\pi = 3.14$

[b] **Without using calculator , prove that :**

$\tan^2 60° - \tan^2 45° = \sin^2 60° + \cos^2 60° + 2 \sin 30°$

3 [a] Find the equation of the straight line perpendicular to $\overline{AB}$ from its midpoint where A $(1 , 3)$ and B $(3 , 5)$

[b] ABC is a right-angled triangle at B , where AC = 5 cm. , BC = 4 cm. , **find the value of :** $2 \cos^2 C + \sin^2 A$

4 [a] Prove that the points A $(3 , -2)$, B $(-5 , 0)$, C $(0 , -7)$, D $(8 , -9)$ are the vertices of a parallelogram.

[b] **Find the value of X where :** $4 X = \cos^2 30° \tan^2 30° \tan^2 45°$

5 [a] If the two straight lines $3 X - 4 y - 3 = 0$ and $k y + 4 X - 8 = 0$ are both perpendicular , then find the value of k

[b] Find the equation of the straight line which intercepts from the two axes , two positive parts of length 1 and 4 from X and y axes respectively.

16 Beni Suef Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer from those given :**

1 $4 \sin 60° \tan 60° =$ ....

(a) 3 (b) 6 (c) 12 (d) $2\sqrt{3}$

2 The image of the point $(4 , 5)$ by the translation $(2 , 3)$ is ....

(a) $(6 , -8)$ (b) $(-8 , 6)$ (c) $(6 , 8)$ (d) $(-6 , -8)$

3 The perpendicular distance between the two straight lines $x - 2 = 0$, $x + 3 = 0$ equals .... length units.

(a) 1 (b) 2 (c) 4 (d) 5

4 The equation of the straight line which passes through the point $(-5 , 3)$ and is parallel to y-axis is ....

(a) $x = -5$ (b) $y = -5$ (c) $y = 3$ (d) $x = 3$

5 The number of the axes of symmetry of the circle is ....

(a) zero (b) 1 (c) 2 (d) an infinite number.

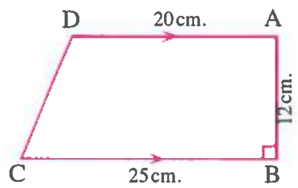
6 The points $(0 , 0)$, $(0 , 6)$ and $(8 , 0)$ ....

(a) form an acute-angled triangle. (b) form a right-angled triangle.

(c) form an obtuse-angled triangle. (d) are collinear.

2 [a] If the point C $(6 , -4)$ is the midpoint of $\overline{AB}$ where A $(5 , -3)$, find the coordinates of the point B

[b] **In the opposite figure :**



ABCD is a trapezium in which

$\overline{AD} // \overline{BC}$, m ($\angle$ B) = 90°

, AD = 20 cm. , AB = 12 cm. and BC = 25 cm.

Find the length of $\overline{DC}$ and m ($\angle$ C)

3 [a] **Prove that :** $\frac{1}{2}$ sin 60° = sin 30° cos 30°

[b] Find the equation of the straight line which passes through the point $(2 , 3)$ and its slope = 2

4 [a] If cos E tan 30° = $\sin^2$ 45°

, find m ($\angle$ E) where E is an acute angle.

[b] Prove that the straight line which passes through the two points $(2 , -1)$ and $(6 , 3)$ is parallel to the straight line which makes a positive angle of measure 45° with the positive direction of x-axis.

5 [a] Prove that the points A $(3 , -1)$, B $(-4 , 6)$ and C $(2 , -2)$ are located on a circle whose centre is M $(-1 , 2)$

[b] Find the slope of the straight line $3y - 2x + 5 = 0$, then find the length of the intersected part from the y-axis.

17 El-Menia Governorate

Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer from those given :

1 The angle whose measure is 65° complements an angle of measure ....°

(a) 35 (b) 25 (c) 115 (d) 45

2 ABCD is a parallelogram. If m (∠ A) + m (∠ C) = 200° , then m (∠ B) = ...°

(a) 50 (b) 80 (c) 100 (d) 160

3 The sum of lengths of any two sides in a triangle is .... the length of the third side.

(a) less than (b) equal to (c) greater than (d) twice

4 If $\sin X = \frac{1}{2}$, then m (∠ X) = ...° , X is an acute angle.

(a) 45 (b) 60 (c) 90 (d) 30

5 The distance between the two points (3 , 0) , (0 , – 4) equals .... length units.

(a) 4 (b) 5 (c) 6 (d) 7

6 If $x + y = 5$, $k x + 2 y = 0$ are two parallel straight lines , then k = ...

(a) – 2 (b) – 1 (c) 1 (d) 2

2 [a] Without using calculator , find the value of the expression :

$\cos 60° \sin 30° - \sin 60° \tan 60° + \cos^2 30°$

[b] Find the equation of the straight line which passes through the point (1 , 2) and is perpendicular to the straight line which passes through the two points A (2 , – 3) , B (5 , – 4)

3 [a] Without using calculator , find the value of x which satisfies :

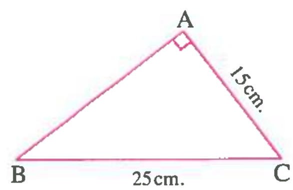
$2 \sin x = \tan^2 60° - 2 \tan 45°$ where x is the measure of an acute angle.

[b] In Δ ABC , m (∠ A) = 90°

, AC = 15 cm. , BC = 25 cm.

Prove that :

cos C cos B – sin C sin B = zero



4 [a] Prove that the points A (– 1 , – 4) , B (1 , 0) and C (2 , 2) are collinear.

[b] If C (6 , – 4) is the midpoint of $\overline{AB}$ where A (5 , – 3) , find the coordinates of the point B

5 **[a]** Prove that the straight line that makes an angle of measure 45° with the positive direction of the x-axis is parallel to the straight line whose equation is $x - y - 1 =$ zero

[b] Find the value of a if the distance between the two points (a , 7) and (– 2 , 3) equals 5 length units.

18 Assiut Governorate

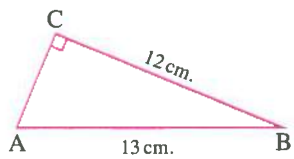
Answer the following questions : ***(Calculator is permitted)***

1 **Choose the correct answer :**

1. The measure of the straight angle is ....°
   (a) 90 (b) 360 (c) 180 (d) 240
2. If $\tan(x + 20)° = \sqrt{3}$ where $(x + 20)°$ is the measure of an acute angle , then $x =$ ....
   (a) 30 (b) 60 (c) 90 (d) 40
3. The length of the side opposite to the angle of measure 30° in the right-angled triangle equals .... the length of the hypotenuse.
   (a) $\frac{1}{4}$ (b) twice (c) $\frac{1}{2}$ (d) $\frac{1}{3}$
4. If $x + y = 5$, $k x + 2 y = 7$ are perpendicular , then k = ...
   (a) – 2 (b) – 1 (c) 1 (d) 2
5. The area of the rhombus whose diagonals lengths are 6 cm. and 12 cm. is .... cm^2.
   (a) 16 (b) 30 (c) 36 (d) 72
6. The perpendicular distance between the two straight lines $x - 3 = 0$, $x + 4 = 0$ equals .... length units.
   (a) 2 (b) 7 (c) 12 (d) 6

2 **[a] In the opposite figure :**

ABC is a right-angled triangle at C , AB = 13 cm.
, BC = 12 cm.
Prove that : sin A cos B + cos A sin B = 1



[b] Show the type of the triangle whose vertices are A (1 , 1) , B (5 , 1) , C (3 , 4) due to its side lengths.

3 **[a]** If $2 \sin x = \tan^2 60° - 4 \sin 30°$, find x , where x is the measure of an acute angle.

[b] ABCD is a parallelogram where A (3 , 2) , B (4 , – 5) , C (1 , 4) , find the two coordinates of the point at which the two diagonals intersect , then find the coordinates of the point D

4 **[a] Without using the calculator , find the value of :** $\cos 60° + \cos^2 30° + \tan^2 45°$

[b] Prove that the straight line passing through the two points $\left(2\sqrt{3} , 3\right)$, $\left(\sqrt{3} , 4\right)$ is perpendicular to the straight line that makes with the positive direction of the X-axis an angle of measure 60°

5 **[a]** Find the equation of the straight line passing through the point (3 , – 5) and parallel to the straight line $X + 3y = 7$

[b] Find the slope of the straight line and the length of the y-intercept by the straight line $\frac{y-1}{X} = \frac{1}{2}$

19 Souhag Governorate

Answer the following questions : ***(Calculator is permitted)***

1 **Choose the correct answer :**

1. The point of concurrence of the medians of the triangle divides each median in the ratio of .... from its base.
   (a) 2 : 3 (b) 2 : 1 (c) 1 : 2 (d) 3 : 2
2. If $\sin X = \cos X$, then $X =$ ....° (X is the measure of an acute angle)
   (a) 30 (b) 45 (c) 60 (d) 90
3. The sum of the measures of the accumulative angles at a point equals ....°
   (a) 30 (b) 60 (c) 180 (d) 360
4. The distance between the two points (3 , 0) , (– 1 , 0) equals .... length units.
   (a) 4 (b) 5 (c) 6 (d) 7
5. The side length of a square is $\sqrt{3}$ cm. , then its area = ... cm².
   (a) $4\sqrt{3}$ (b) 9 (c) 3 (d) 6
6. If A (5 , – 3) , B (7 , – 5) , then the midpoint of $\overline{AB}$ is ....
   (a) (3 , 5) (b) (2 , 0) (c) (5 , – 5) (d) (6 , – 4)

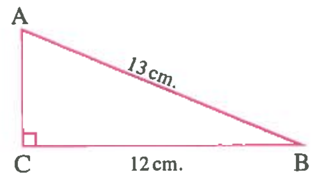
2 **[a]** If $\cos X = 2\cos^2 30° - 1$ (X is the measure of an acute angle) **, find :** X

[b] Prove that the triangle whose vertices are A (1 , 4) , B (– 1 , – 2) , C (2 , – 3) is right-angled at B

3 **[a] In the opposite figure :**

The triangle ABC is right-angled at C

, AB = 13 cm. , BC = 12 cm.



Find : **1** The length of $\overline{AC}$

2 The value of sin A cos B + cos A sin B

[b] Find the equation of the straight line whose slope equals 2 and passes through the point (1 , 0)

4 **[a] Without using the calculator , prove that :** $2 \sin 30^\circ = \tan^2 60^\circ - 2 \tan 45^\circ$

[b] Find the equation of the straight line passing through the points (1 , 3) , (– 1 , – 3) , then prove that it passes through the origin point.

5 **[a]** Prove that the points A (– 3 , – 1) , B (6 , 5) , C (3 , 3) are collinear.

[b] Prove that the straight line passing through the two points (– 3 , – 2) , (4 , 5) is parallel to the straight line which makes with the positive direction of the X-axis an angle of measure 45°

20 Qena Governorate

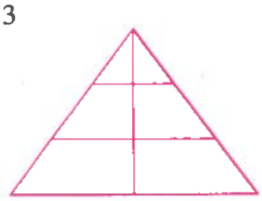
Answer the following questions :

1 **Choose the correct answer :**

1 If $\sin X = \frac{1}{2}$ where X is the measure of an acute angle , then $\sin 2X =$ ....

(a) $\frac{1}{4}$ (b) $\frac{\sqrt{3}}{2}$ (c) 60 (d) $\frac{1}{\sqrt{3}}$

2 The number of quadrilaterals in the opposite figure is ....



(a) 3 (b) 6

(c) 9 (d) 12

3 If the two straight lines $X + y = 4$, $a X + 3 y = 0$ are perpendicular , then a = ...

(a) – 3 (b) – 1 (c) 1 (d) 3

4 The number of axes of symmetry of the rhombus equals ....

(a) 1 (b) 2 (c) 3 (d) 4

5 The straight line whose equation is $2 y = 3 X - 6$ intercepted a part equal .... units from y-axis.

(a) 6 (b) 2 (c) 3 (d) $\frac{3}{2}$

6 The image of the point (– 3 , 2) by reflection on the origin point is ....

(a) (3 , 2) (b) (3 , – 2) (c) (– 3 , – 2) (d) (– 3 , 2)

2 [a] Δ ABC is a right-angled triangle at B , AC = 10 cm. , BC = 8 cm.

Prove that : $\sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

[b] Prove that the points A (1 , 1) , B (0 , – 1) , C (2 , 3) are collinear.

3 [a] If $\sin X \tan 30° = \sin^2 45°$, find the value of X in degrees , where X is the measure of an acute angle.

[b] Prove that the straight line passing through (– 1 , 3) , (2 , 4) is parallel to the straight line whose equation is $3y - X - 1 = 0$

4 [a] **Without using calculator , prove that :** $\sin 60° = 2 \sin 30° \cos 30°$

[b] ABCD is a quadrilateral in which :

A (5 , 3) , B (6 , – 2) , C (1 , – 1) , D (0 , 4)

Prove that : ABCD is a rhombus and find its area.

5 [a] Prove that the points A (– 3 , 0) , B (3 , 4) , C (1 , – 6) are the vertices of an isosceles triangle its vertex A , then find the length of the perpendicular segment from A to $\overline{BC}$

[b] ABCD is a parallelogram in which A (3 , 2) , B (4 , – 5) , C (0 , – 3)

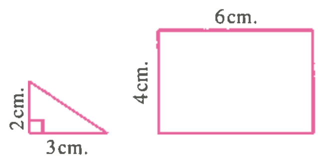
Find the coordinates of the point D

21 Luxor Governorate

Answer the following questions :

1 **Choose the correct answer :**

1 The number of the right triangles which completely cover the surface of the rectangle equals ....



(a) 10 (b) 8

(c) 6 (d) 4

2 If m (∠ A) = 85° and sin B = cos B in Δ ABC , then m (∠ C) = ...°

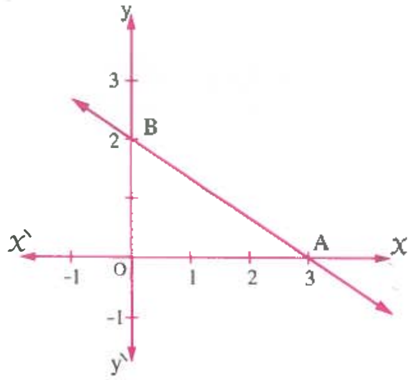
(a) 30 (b) 45 (c) 50 (d) 60

3 The image of the point (– 5 , 6) by translation (3 , – 2) is ....

(a) (– 4 , – 2) (b) (4 , 2) (c) (– 2 , 4) (d) (– 2 , – 4)

4 **In the opposite figure :**

The slope of $\overleftrightarrow{AB}$ equals ....



(a) $\frac{2}{3}$

(b) $\frac{-2}{3}$

(c) $\frac{3}{2}$

(d) $\frac{-3}{2}$

5 The measure of the exterior angle at any vertex of an equilateral triangle equals ....°

(a) 30 (b) 60 (c) 90 (d) 120

6 If C $(-3, y)$ is the midpoint of $\overline{AB}$ where A $(x, -6)$ and B $(9, -12)$, then $y - x =$ ....

(a) 7 (b) 9 (c) 6 (d) -18

2 **[a]** If the distance between the two points $(a, 5)$, $(3a - 1, 1)$ equals 5 length units, then find a

[b] If $3 \tan x - 4 \sin^2 30° = 8 \cos^2 60°$, find x where x is the measure of an acute angle.

3 **[a]** Find the equation of the straight line passing by $(1, 2)$ and parallel to the straight line $2x + 3y - 6 = 0$

[b] Find the measure of the angle made by the straight line passing by the two points $\left(-2, \sqrt{3}\right)$, $\left(1, 4\sqrt{3}\right)$ with the positive direction of the x-axis.

4 **[a]** $\overline{AB}$ is a diameter of the circle M where A $(4, -1)$, B $(-2, 7)$, find the radius length of the circle and find its area.

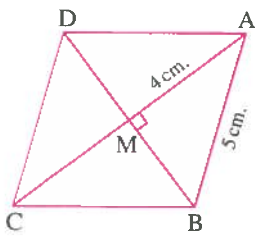
[b] ABC is a triangle where AB = AC = 10 cm., BC = 12 cm., draw $\overline{AD} \perp \overline{BC}$ and intersects it at D **Prove that :**

1 $\sin^2 C + \cos^2 C = 1$ 2 $\sin B + \cos C > 1$

5 **[a]** If $\overleftrightarrow{AB}$ // the y-axis where A $(x, 7)$, B $(3, 5)$, find the value of x

[b] **In the opposite figure :**

ABCD is a rhombus, its two diagonals intersect at M, if AB = 5 cm., AM = 4 cm., **find :**



1 m (∠ BAD)

2 The area of the rhombus ABCD

22 Aswan Governorate

Answer the following questions : ***(Calculator is allowed)***

1 Choose the correct answer from those given :

1 The angle with measure 65° is complement of an angle with measure ....

(a) 135° (b) 115° (c) 25° (d) 15°

2 If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{1}{2}$, then the slope of $\overleftrightarrow{CD} =$ ....

(a) 2 (b) – 2 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

3 If C $\in$ the axis of symmetry of $\overline{AB}$, then CA .... CB

(a) $\perp$ (b) < (c) > (d) =

4 If 3 cm. , 7 cm. and y are lengths of sides of a triangle , then y = ... cm.

(a) 3 (b) 4 (c) 7 (d) 10

5 The distance between the two points (6 , 0) and (0 , 8) equals .... length units.

(a) 6 (b) 8 (c) 10 (d) 14

6 If $\tan (X + 10) = \sqrt{3}$ where X is the measure of an acute angle , then $X =$ ....

(a) 80° (b) 50° (c) 35° (d) 20°

2 **[a]** If $2 \sin X = \tan^2 60° - 2 \tan^2 45°$, find the value of X where X is the measure of an acute angle.

[b] Find the equation of the straight line which is perpendicular to $\overline{AB}$ from its midpoint where A (1 , 3) and B (3 , 5)

3 **[a]** If C (4 , 2) is the midpoint of $\overline{AB}$ where A (2 , 4) and B (6 , y) , find the value of y

[b] If the points A (– 1 , – 1) , B (2 , 3) , C (6 , 0) are the vertices of a triangle.

, **prove that :** Δ ABC is right-angled at B

4 **[a]** XYZ is a right-angled triangle at Y , if XY = 5 cm. , XZ = 13 cm.

, **find :** 1 tan X × tan Z 2 cos X cos Z – sin X sin Z

[b] Find the equation of the straight line which intercepts from the positive parts of the coordinates axes two parts of lengths 1 and 4 from X and y axes respectively.

5 **[a]** Prove that the straight line which passes through the two points (– 1 , 3) and (2 , 4) is parallel to the straight line whose equation is $3y - X - 1 = 0$

[b] Δ ABC is a right-angled triangle at B , if $2 AB = \sqrt{3} AC$

, find the main trigonometric ratios of the angle C

23 New Valley Governorate

إيمان عمل تنمية

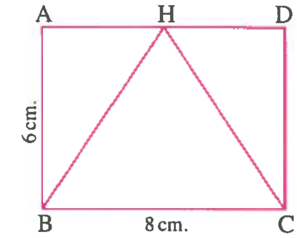
Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer from those given :

1 The quadrilateral ABCD in which AB > CD , $\overline{AB} \parallel \overline{CD}$ is ....

(a) a square. (b) a rectangle. (c) a rhombus. (d) a trapezium.

2 **In the opposite figure :**



ABCD is a rectangle , AB = 6 cm. , BC = 8 cm.

, H ∈ $\overline{AD}$, the area of Δ HBC = ... cm²

(a) 14 (b) 24

(c) 28 (d) 48

3 For any angle A , $\frac{\sin A}{\cos A}$ = ...

(a) sin A (b) cos A (c) tan A (d) 1

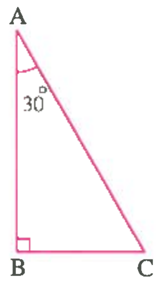
4 If ABCD is a rectangle , A (1 , 0) , C (4 , 4) , then BD = ... length units.

(a) 5 (b) 8 (c) 9 (d) 10

5 If $x + y = 5$ and $k\,x + 2\,y = 1$ are perpendicular , then k = ...

(a) 2 (b) 1 (c) – 1 (d) – 2

6 **In the opposite figure :**



BC : AC : AB = ...

(a) $1 : \sqrt{3} : 2$

(b) $2 : \sqrt{3} : 1$

(c) $1 : 2 : \sqrt{3}$

(d) $\sqrt{3} : 1 : 2$

2 [a] XYZ is a right-angled triangle at Z , XZ = 3 cm. , YZ = 4 cm. **Find the value of :**

1 tan X tan Y 2 $\sin^2 X + \cos^2 X$

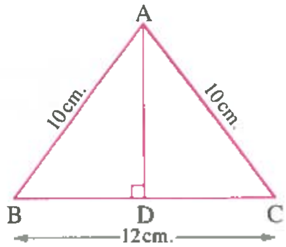
[b] Determine the type of the triangle whose vertices are A (3 , 3) , B (1 , 5) , C (1 , 3) according to its side lengths and according to its angles.

3 [a] If $\tan x = 4 \sin 30° \cos 60°$, x is the measure of an acute angle , **then find the value of each of :**

1 x 2 $\sin x$

[b] Find the equation of the straight line whose slope is 2 and passes through the point (1 , 0)

4 **[a] In the opposite figure :**



ABC is a triangle , AB = AC = 10 cm.

, BC = 12 cm. , $\overline{AD} \perp \overline{BC}$ **Find the value of :**

1 cos B   2 m (∠ B)   3 sin (90° – B)

[b] ABCD is a rhombus , A (– 2 , 3) , B (– 1 , – 2) , C (4 , – 3)

Find : 1 The coordinates of the point of intersection of its diagonals.

2 The coordinates of the point D

5 **[a]** If the straight line L_1 passes through the points (2 , 1) , (3 , k) and the straight line L_2 makes with the positive direction of the X-axis an angle of measure 45° , find the value of k , if $L_1 // L_2$

[b] Find the equation of the straight line which intersects from the two axes two positive parts of lengths 2 and 4 from X and y axes respectively.

24 South Sinai Governorate

Answer the following questions :

1 **Choose the correct answer from those given :**

1 If $\cos (X + 15°) = \frac{1}{2}$, then $\tan X =$ .... where X is the measure of an acute angle.

(a) 1   (b) $\sqrt{3}$ (c) $\frac{\sqrt{3}}{3}$ (d) $\frac{1}{2}$

2 The distance between the two points (– 3 , 0) and (0 , – 4) equals .... length units.

(a) 4   (b) 5   (c) 3   (d) 2

3 If A = (– 4 , 5) and B = (– 2 , – 1) , then the midpoint of $\overline{AB}$ is ....

(a) (0 , 1)   (b) (– 3 , 3)   (c) (– 3 , 2)   (d) (1 , 0)

4 ABC is a triangle in which m (∠ A) = 120° , AB = AC , then m (∠ C) = ...

(a) 60°   (b) 45°   (c) 50°   (d) 30°

5 If $X + y = 5$ and $k X + 2 y = 0$ are two straight lines perpendicular , then k = ...

(a) – 2   (b) 2   (c) – 1   (d) 1

6 ABC is a right-angled triangle at A and $\overline{AD} \perp \overline{BC}$, where D ∈ $\overline{BC}$, then $(AD)^2 =$ ....

(a) BD × BC   (b) CD × CB   (c) DB × DC   (d) $(DB)^2 \times (DC)^2$

2 **[a] Without using calculator , prove that :** $\cos 60° = \cos^2 30° - \sin^2 30°$

[b] If the point D = (1 , – 3) is the midpoint of $\overline{AB}$, A = (4 , – 3)

, find the coordinates of the point B

3 [a] Find the equation of the straight line which passes through the points (1 , 3) and (– 1 , – 3)

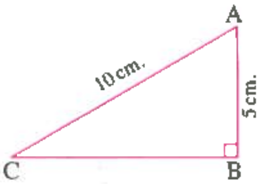
[b] Show the type of the triangle ABC whose vertices are A = (3 , 3) , B = (1 , 5) and C = (1 , 3) due to its side lengths.

4 [a] Find the equation of the straight line which passes through the point (– 2 , 3) and makes with the positive direction of the X-axis an angle of measure 45°

[b] **Find the value of :** $\frac{2 \tan 45°}{1 + \tan^2 45°}$

5 [a] Find the equation of the straight line which its slope is 2 , and intersects a positive part from y-axis that is equal to 5 units.

[b] **In the opposite figure :**



ABC is a triangle right-angled at B

, in which AC = 10 cm. , AB = 5 cm.

Find : 1 m (∠ C)   2 $\sin^2 C + \cos^2 C$

25 North Sinai Governorate

Answer the following questions :

1 **Choose the correct answer from those given :**

1 If $\sin X = \frac{1}{2}$ where X is the measure of an acute angle , then $X =$ ....

(a) 90° (b) 60° (c) 45° (d) 30°

2 The measure of the exterior angle of the equilateral triangle equals ....

(a) 60° (b) 90° (c) 120° (d) 180°

3 The slope of the straight line which makes with the positive direction of X-axis a positive angle of measure 45° equals ....

(a) 1 (b) – 1 (c) zero (d) 1.4

4 The angle whose measure is 40° complements an angle of measure ....

(a) 30° (b) 140° (c) 50° (d) 40°

5 If A (2 , – 2) , B (– 2 , 2) , then the midpoint of $\overline{AB}$ is ....

(a) (– 1 , 1) (b) (1 , – 1) (c) (4 , – 4) (d) (0 , 0)

6 If 3 , 7 , ℓ are the lengths of the sides of a triangle , then ℓ can be equal to ....

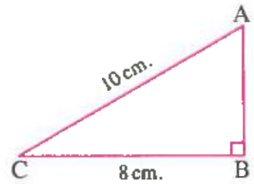
(a) 3 (b) 4 (c) 7 (d) 10

2 **[a] Prove that :** $\cos 60^\circ = 2\cos^2 30^\circ - 1$ (Without using the calculator)

[b] Prove that the triangle whose vertices are A (1 , – 2) , B (– 4 , 2) and C (1 , 6) is an isosceles triangle.

3 **[a]** Find the equation of the straight line whose slope = 2 and cuts 7 units from the positive part of y-axis.

[b] In the opposite figure :



ABC is a right-angled triangle at B in which AC = 10 cm.

, BC = 8 cm.

1 **Find the length of :** $\overline{AB}$

2 **Prove that :** $\sin^2 A + \cos^2 A = 1$

4 **[a]** If $\cos X = \frac{\sin 60^\circ \sin 30^\circ}{\sin^2 45^\circ}$, find the value of X where X is the measure of an acute angle. (Without using the calculator)

[b] Find the equation of the straight line passing through the point (1 , 2) and perpendicular to the straight line passing through the two points (2 , – 3) , (5 , – 4)

5 If A (3 , – 1) , B (– 4 , 6) , C (2 , – 2) and M (– 1 , 2) :

1 Prove that the points A , B , C lie on the circle whose centre is M

2 Find the circumference of the circle M ($\pi = 3.14$)

26 Red Sea Governorate

Answer the following questions :

1 **Choose the correct answer from those given :**

1 If A (5 , 7) , B (1 , – 1) , then the midpoint of $\overline{AB}$ is ....

(a) (2 , 3) (b) (3 , 3) (c) (3 , 2) (d) (3 , 4)

2 A rhombus whose diagonals lengths are 6 cm. , 8 cm. , then its area is .... cm^2.

(a) 48 (b) 28 (c) 24 (d) 14

3 If $\cos X = \frac{\sqrt{3}}{2}$ where X is the measure of an acute angle , then $\sin 2X$ = ...

(a) $\frac{\sqrt{3}}{2}$ (b) 1 (c) – 2 (d) $\frac{1}{\sqrt{3}}$

4 If the lengths of two sides of an isosceles triangle are 5 cm. and 13 cm. , then the length of the third side is .... cm.

(a) 5 (b) 8 (c) 13 (d) 16

5 If the two straight lines $3X - 4y = 3$ and $4X + ky = 8$ are perpendicular , then $k =$ ....

(a) 4 (b) 3 (c) -4 (d) -3

6 The number of axes of symmetry of the equilateral triangle equals ....

(a) zero (b) 1 (c) 2 (d) 3

2 **[a] Without using calculator , prove that :** $\sin 60° = 2 \sin 30° \cos 30° \tan 45°$

[b] Find the equation of the straight line which passes through the two points $(4 , 2) , (-2 , -1)$

3 **[a]** Find the value of X if $\tan X = 4 \cos 60° \sin 30°$ where X is the measure of an acute angle.

[b] Prove that the points $A (2 , 4)$, $B (-3 , 0)$ and $C (-7 , 5)$ are the vertices of a right-angled triangle , then find its area.

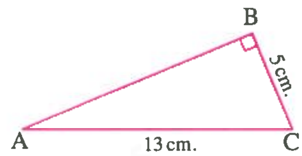
4 **[a]** Find the equation of the straight line which its slope is 2 and intercepts from the positive part of y-axis 7 length units.

[b] In the opposite figure :

ABC is a right-angled triangle at B

, AC = 13 cm. , BC = 5 cm.

Find the value of : $\sin A \cos C + \cos A \sin C$



5 **[a]** If the distance between the two points $(X , 7) , (-2 , 3)$ equals 5 length units , find the value of X

[b] If the straight line L_1 passes through the two points $(3 , 1) , (2 , k)$ and the straight line L_2 makes with the positive direction of the X-axis a positive angle its measure is 45° , find the value of k if $L_1 // L_2$

27 Matrouh Governorate

Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1 If $\cos 2X = \frac{1}{2}$, then $m (\angle X) =$ ....

(a) 15° (b) 30° (c) 45° (d) 60°

2 The angle measured 37° is complemented by an angle of measurement ....

(a) 53° (b) 143° (c) 37° (d) 90°

3 If $\frac{-2}{3}$, $\frac{k}{2}$ are the slopes of two parallel straight lines , then k = ...

(a) $\frac{-4}{3}$ (b) $\frac{-3}{4}$ (c) 3 (d) $\frac{1}{3}$

4 The area of the circle equals ....

(a) πr (b) $2 \pi r$ (c) πr^2 (d) $2 \pi r^2$

5 In Δ ABC , AB + BC .... AC

(a) > (b) ≥ (c) < (d) ≤

6 If $\overline{AB}$ is a diameter of a circle , where A (3 , – 5) , B (5 , 1) , then the centre of the circle is ....

(a) (8 , – 2) (b) (4 , 2) (c) (2 , 2) (d) (4 , – 2)

2 [a] **Without using calculator , prove that :**

$$\tan 60° = \frac{2 \tan 30°}{1 - \tan^2 30°}$$

[b] Prove that the points A (6 , 0) , B (2 , – 4) , C (– 4 , 2) are the vertices of a right-angled triangle at B

3 [a] If the distance between the two points (a , 7) and (– 2 , 3) equals 5 length units , find the value of a

[b] ABC is a right-angled triangle at B , AB = 3 cm. , BC = 4 cm.

Find the value of : sin A cos C + cos A sin C

4 [a] If A , B are the measures of two complementary angles

, where A : B = 1 : 2

, **find :** sin A + cos B

[b] Find the slope and the intercepted part of y-axis of the straight line whose equation is $\frac{x}{2} + \frac{y}{2} = 1$

5 [a] If C is the midpoint of $\overline{AB}$, where A = (x , – 6) , B = (9 , – 12) and C = (– 3 , y) , find the values of x , y

[b] Find the equation of the straight line passing through the point (3 , – 5) and parallel to the straight line $x + 2y = 7$

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Answers of model examinations of the school book of trigonometry & geometry

Model 1

1

1 a	2 c	3 b
4 a	5 b	6 a

2

[a] $\because \sin 60^\circ = \frac{\sqrt{3}}{2}$ (1)

$,\ 2 \sin 30^\circ \cos 30^\circ = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) : $\therefore \sin 60^\circ = 2 \sin 30^\circ \cos 30^\circ$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{5+1}{6+3} = \frac{2}{3}$

, the slope of $\overleftrightarrow{BC} = \frac{3-5}{3-6} = \frac{2}{3}$

$\therefore$ The slope of $\overleftrightarrow{AB}$ = the slope of $\overleftrightarrow{BC}$

$\therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

, $\because$ B is a common point between the two straight lines.

$\therefore$ The points A , B and C are collinear.

3

[a] $\because 4 \cos 60^\circ \sin 30^\circ = 4 \times \frac{1}{2} \times \frac{1}{2} = 1$

$\therefore \tan X = 1$ $\qquad \therefore X = 45^\circ$

[b] Let B (X , y)

$\therefore (6 , -4) = \left(\frac{X+5}{2} , \frac{y-3}{2}\right)$

$\therefore \frac{X+5}{2} = 6$ $\qquad \therefore X + 5 = 12$ $\qquad \therefore X = 7$

$, \frac{y-3}{2} = -4$ $\qquad \therefore y - 3 = -8$ $\qquad \therefore y = -5$

$\therefore$ B $(7 , -5)$

4

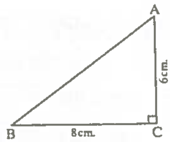
[a] $\because m_1 = \frac{k-1}{2-3} = 1 - k$

$, m_2 = \tan 45^\circ = 1$

$, \because L_1 \parallel L_2$ $\qquad \therefore m_1 = m_2$

$\therefore 1 - k = 1$ $\qquad \therefore k = 0$

[b] $\because m(\angle C) = 90^\circ$



$\therefore (AB)^2 = (6)^2 + (8)^2$

$= 100$

$\therefore AB = 10$ cm.

1 $\cos A \cos B - \sin A \sin B$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

2 $\because \cos B = \frac{8}{10}$ $\qquad \therefore m(\angle B) \simeq 36^\circ\ 52'\ 12''$

5

[a] $\because$ The slope of the straight line = 2

$\therefore$ The equation of the straight line is :

$y = 2X + c$

, $\because (1 , 0)$ satisfies the equation.

$\therefore 0 = 2 \times 1 + c$ $\qquad \therefore c = -2$

$\therefore$ The equation of the straight line is : $y = 2X - 2$

[b] $\because MA = \sqrt{(-1-3)^2 + (2+1)^2} = \sqrt{16+9} = \sqrt{25}$

= 5 length units

$, MB = \sqrt{(-1+4)^2 + (2-6)^2} = \sqrt{9+16}$

$= \sqrt{25} = 5$ length units

$, MC = \sqrt{(-1-2)^2 + (2+2)^2} = \sqrt{9+16}$

$= \sqrt{25} = 5$ length units

$\therefore MA = MB = MC$

$\therefore$ A , B and C are located on the circle M

, the circumference $= 2\pi r = 2 \times \pi \times 5$

$= 10\pi$ length units

Model 2

1

1 a	2 d	3 b
4 c	5 b	6 b

2

[a] $\because \cos E \tan 30^\circ = \cos^2 45^\circ$

$\therefore \cos E \times \frac{1}{\sqrt{3}} = \left(\frac{1}{\sqrt{2}}\right)^2$

$\therefore \cos E = \frac{\sqrt{3}}{2}$ $\qquad \therefore m(\angle E) = 30^\circ$

[b] $\because AB = \sqrt{(3-1)^2 + (3-5)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units

, $BC = \sqrt{(1-1)^2 + (5-3)^2} = \sqrt{4} = 2$ length units

, $AC = \sqrt{(3-1)^2 + (3-3)^2} = \sqrt{4} = 2$ length units

$\therefore BC = AC$ $\qquad \therefore \Delta ABC$ is isosceles.

3

[a] $\because$ The slope of the straight line $= \frac{-3-3}{-1-1} = 3$

$\therefore$ The equation of the straight line is : $y = 3x + c$

, $\because$ (1 , 3) satisfies the equation

$\therefore 3 = 3 \times 1 + c$ $\qquad \therefore c = 0$

$\therefore$ The equation of the straight line is : $y = 3x$

, $\because c = 0$

$\therefore$ The straight line passes through the origin point.

[b] $\because (3 , 1) = \left(\frac{1+x}{2} , \frac{y+3}{2}\right)$

$\therefore \frac{1+x}{2} = 3$ $\qquad \therefore 1 + x = 6$

$\therefore x = 5$ $\qquad , \frac{y+3}{2} = 1$

$\therefore y + 3 = 2$ $\qquad \therefore y = -1$

$\therefore (x , y) = (5 , -1)$

4

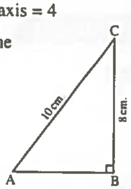
[a] $\because$ The straight line passes through the two points (1 , 0) and (0 , 4)

$\therefore$ The slope $= \frac{4-0}{0-1} = -4$

$\therefore$ The equation of the straight line is :
$y = -4x + c$

, $\because$ the intercepted part from y-axis = 4

$\therefore$ The equation of the straight line is : $y = -4x + 4$



[b] $\because m(\angle B) = 90°$

$\therefore (AB)^2 = (10)^2 - (8)^2 = 36$

$\therefore AB = 6$ cm.

$\therefore \sin^2 A + 1 = \left(\frac{8}{10}\right)^2 + 1 = \frac{41}{25}$ (1)

, $2\cos^2 C + \cos^2 A = 2 \times \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2 = \frac{41}{25}$ (2)

From (1) , (2) :

$\therefore \sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

5

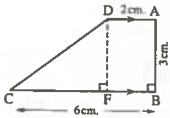
[a] $\because m_1 = \frac{4-3}{2+1} = \frac{1}{3}$

, $m_2 = \frac{1}{3}$ $\qquad \therefore m_1 = m_2$ $\qquad \therefore L_1 \parallel L_2$

[b] Draw $\overline{DF} \perp \overline{BC}$

$\because \overline{AD} \parallel \overline{BC}$, $\overline{AB} \perp \overline{BC}$

, $\overline{DF} \perp \overline{BC}$



$\therefore$ ABFD is a rectangle

$\therefore BF = AD = 2$ cm.

, $AB = DF = 3$ cm.

$\therefore FC = 6 - 2 = 4$ cm.

From Δ DFC which is right-angled at F

$\therefore (DC)^2 = (3)^2 + (4)^2 = 25$

$\therefore DC = 5$ cm.

$\therefore \cos(\angle BCD) = \frac{4}{5}$

Answers of model for the merge students

1

1 ✔	2 ✔	3 ✘
4 ✘	5 ✘	6 ✔

2

1 b	2 c	3 d
4 c	5 a	6 c

3

1 0	2 1	3 10
4 2	5 -3	6 $\frac{\sqrt{3}}{2}$

4

1 $\frac{1}{2}$	2 $\frac{3}{5}$	3 3
4 2	5 5 length units	6 $(-5 , 2)$

Answers of governorates' examinations of trigonometry & geometry

1 Cairo

1

1 d 2 a 3 c 4 b 5 d 6 c

2

[a] $\because x \sin 45^\circ \cos 45^\circ = \sin 30^\circ$

$\therefore x \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = \frac{1}{2}$ $\therefore \frac{1}{2} x = \frac{1}{2}$

$\therefore x = 1$

[b] $\because$ The slope of the straight line $= 2$

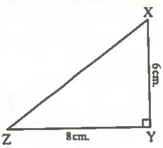
$\therefore$ Its equation is : $y = 2x + c$

$, \because (1 , 0)$ satisfies the equation.

$\therefore 0 = 2 \times 1 + c$ $\therefore c = -2$

$\therefore$ The equation is : $y = 2x - 2$

3



[a] $\because m(\angle Y) = 90^\circ$

$\therefore (XZ)^2 = (6)^2 + (8)^2 = 100$

$\therefore XZ = 10$ cm.

$\therefore \cos X \cos Z - \sin X \sin Z$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

[b] $\because AB = \sqrt{(-3-2)^2 + (0-4)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

$, BC = \sqrt{(-7+3)^2 + (5-0)^2} = \sqrt{16+25}$

$= \sqrt{41}$ length units

$, CD = \sqrt{(-2+7)^2 + (9-5)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

$, AD = \sqrt{(-2-2)^2 + (9-4)^2} = \sqrt{16+25}$

$= \sqrt{41}$ length units

$\therefore AB = BC = CD = AD$ $\therefore ABCD$ is a rhombus

$, \because AC = \sqrt{(-7-2)^2 + (5-4)^2} = \sqrt{81+1}$

$= \sqrt{82}$ length units

$, BD = \sqrt{(-2+3)^2 + (9-0)^2} = \sqrt{1+81}$

$= \sqrt{82}$ length units

$\therefore AC = BD$ $\therefore ABCD$ is a square.

4

[a] 1 In ΔABC :

$\because m(\angle B) = 90^\circ$

$\therefore (BC)^2 = (25)^2 - (15)^2 = 400$

$\therefore BC = 20$ cm.

2 $\because \sin(\angle ACB) = \frac{15}{25}$

$\therefore m(\angle ACB) \simeq 36^\circ\ 52'\ 12''$

3 The area $= 20 \times 15 = 300$ cm^2.

[b] Let $B(x , y)$

$\therefore (6 , -4) = \left(\frac{5+x}{2} , \frac{-3+y}{2}\right)$

$\therefore \frac{5+x}{2} = 6$ $\therefore 5 + x = 12$ $\therefore x = 7$

$, \frac{-3+y}{2} = -4$ $\therefore -3 + y = -8$ $\therefore y = -5$

$\therefore B(7 , -5)$

5

[a] $\because$ The two straight lines are parallel

$\therefore m_1 = m_2$ $\therefore \frac{-a}{2} = \tan 45^\circ$

$\therefore \frac{-a}{2} = 1$ $\therefore a = -2$

[b] $\because$ The slope of the straight line $= \frac{-1-2}{-2-4} = \frac{1}{2}$

$\therefore$ Its equation is : $y = \frac{1}{2} x + c$

$, \because (4 , 2)$ satisfies the equation.

$\therefore 2 = \frac{1}{2} \times 4 + c$ $\therefore c = 0$

$\therefore$ The equation is : $y = \frac{1}{2} x$

$, \because c = 0$

$\therefore$ The straight line passes through the origin point.

2 Giza

1

1 d 2 d 3 a 4 b 5 c 6 c

2

[a] $\because$ The slope $= 2$

$\therefore$ The equation is : $y = 2x + c$

$, \because (1 , -1)$ satisfies the equation.

$\therefore -1 = 2 \times 1 + c$ $\therefore c = -3$

$\therefore$ The equation is : $y = 2x - 3$

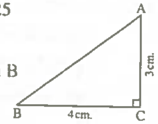
[b] $\boxed{1}$ $\because m(\angle C) = 90°$

$\therefore (AB)^2 = (3)^2 + (4)^2 = 25$

$\therefore AB = 5$ cm.

$\therefore \cos A \cos B - \sin A \sin B$

$= \frac{3}{5} \times \frac{4}{5} - \frac{4}{5} \times \frac{3}{5} = 0$



$\boxed{2}$ $\because \tan B = \frac{3}{4}$ $\therefore m(\angle B) \simeq 36° \, 52' \, 12''$

$\boxed{3}$

[a] $\because \sin 60° = \frac{\sqrt{3}}{2}$ (1)

, $2 \sin 30° \cos 30° = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) : $\therefore \sin 60° = 2 \sin 30° \cos 30°$

[b] $\because L_1 \perp L_2$ $\therefore m_1 \times m_2 = -1$

$\therefore \frac{k-1}{2-3} \times \tan 45° = -1$

$\therefore (1-k) \times 1 = -1$ $\therefore k = 2$

$\boxed{4}$

[a] $\because \cos E \tan 30° = \cos^2 45°$

$\therefore \cos E \times \frac{1}{\sqrt{3}} = \left(\frac{1}{\sqrt{2}}\right)^2$

$\therefore \cos E = \frac{\sqrt{3}}{2}$ $\therefore m(\angle E) = 30°$

[b] $\because AB = \sqrt{(1-3)^2 + (5-3)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units

, $BC = \sqrt{(1-1)^2 + (3-5)^2} = \sqrt{0+4}$

$= 2$ length units

, $AC = \sqrt{(1-3)^2 + (3-3)^2} = \sqrt{4+0}$

$= 2$ length units

$\therefore BC = AC$

$\therefore \Delta ABC$ is isosceles.

$\boxed{5}$

[a] $m = \frac{-5}{4}$

The intercepted part is $\frac{5}{2}$ from the negative part of the y-axis.

[b] $\because MA = \sqrt{(3+1)^2 + (-1-2)^2} = \sqrt{16+9}$

$= 5$ length units

, $MB = \sqrt{(-4+1)^2 + (6-2)^2} = \sqrt{9+16}$

$= 5$ length units

, $MC = \sqrt{(2+1)^2 + (-2-2)^2} = \sqrt{9+16}$

$= 5$ length units

$\therefore MA = MB = MC$

$\therefore$ A , B , C belong to the circle M

, the area $= 3.14 \times 5^2 = 78.5$ square units.

3 Alexandria

$\boxed{1}$

$\boxed{1}$ b $\boxed{2}$ c $\boxed{3}$ a $\boxed{4}$ d $\boxed{5}$ d $\boxed{6}$ a

$\boxed{2}$

[a] $\because x \sin 30° \cos^2 45° = \sin^2 60°$

$\therefore x \times \frac{1}{2} \times \left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$

$\therefore \frac{1}{4} x = \frac{3}{4}$ $\therefore x = 3$

[b] $\because$ The two diagonals of the parallelogram bisect each other

Let M be the intersection point of the diagonals

$\therefore M = \left(\frac{3+0}{2} , \frac{2-3}{2}\right) = \left(\frac{3}{2} , \frac{-1}{2}\right)$

Let $D(x , y)$

$\therefore \left(\frac{3}{2} , \frac{-1}{2}\right) = \left(\frac{4+x}{2} , \frac{-5+y}{2}\right)$

$\therefore \frac{4+x}{2} = \frac{3}{2}$ $\therefore 4 + x = 3$ $\therefore x = -1$

, $\frac{-5+y}{2} = \frac{-1}{2}$ $\therefore -5 + y = -1$ $\therefore y = 4$

$\therefore D(-1 , 4)$

$\boxed{3}$

[a] $\because MA = \sqrt{(3+1)^2 + (-1-2)^2} = \sqrt{16+9}$

$= 5$ length units

, $MB = \sqrt{(-4+1)^2 + (6-2)^2} = \sqrt{9+16}$

$= 5$ length units

, $MC = \sqrt{(2+1)^2 + (-2-2)^2} = \sqrt{9+16}$

$= 5$ length units

$\therefore MA = MB = MC$

$\therefore$ A , B , C are located on the circle M

, the circumference $= 2 \times 3.14 \times 5$

$= 31.4$ length units.

[b] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line $= 2$

$\therefore$ Its equation is : $y = 2x + c$

, $\because$ it intercepts a part of 7 units from the positive part of the y-axis

$\therefore$ Its equation is : $y = 2x + 7$

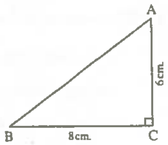
4

[a] $\because m_1 = \frac{5+2}{4+3} = 1$, $m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] $\because m(\angle C) = 90°$



$\therefore (AB)^2 = (6)^2 + (8)^2 = 100$

$\therefore AB = 10$ cm.

$\therefore \cos A \cos B - \sin A \sin B$

$= \frac{6}{10} \times \frac{8}{10} - \frac{8}{10} \times \frac{6}{10} = 0$

5

[a] Let D be the midpoint of $\overline{BC}$

$\therefore D = \left(\frac{3+1}{2}, \frac{7-3}{2}\right) = (2, 2)$

$\therefore$ The slope of $\overleftrightarrow{AD} = \frac{2+6}{2-4} = -4$

$\therefore$ Its equation is : $y = -4x + c$

, $\because (4, -6)$ satisfies the equation.

$\therefore -6 = -4 \times 4 + c$ $\qquad \therefore c = 10$

$\therefore$ The equation is : $y = -4x + 10$

[b] 1 In ΔABC : $\because m(\angle B) = 90°$

$\therefore \sin(\angle ACB) = \frac{15}{25}$

$\therefore m(\angle ACB) \simeq 36° 52' 12''$

2 $\because (BC)^2 = (25)^2 - (15)^2 = 400$

$\therefore BC = 20$ cm.

$\therefore$ The area $= 20 \times 15 = 300$ cm^2.

4 El-Kalyoubia

1

1 d 2 b 3 c 4 a 5 c 6 c

2

[a] $\because \sqrt{(x-6)^2 + (5-1)^2} = 2\sqrt{5}$ (Squaring both sides)

$\therefore (x-6)^2 + 16 = 20$

$\therefore x^2 - 12x + 36 + 16 - 20 = 0$

$\therefore x^2 - 12x + 32 = 0$

$\therefore (x-8)(x-4) = 0$

$\therefore x = 8$ or $x = 4$

[b] $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2$

$= \frac{1}{2} + \frac{1}{4} - \frac{3}{4} = 0$

3

[a] $\because$ The two diagonals of the parallelogram bisect each other

Let M be the intersection point of the diagonals

$\therefore M = \left(\frac{3+0}{2}, \frac{2-3}{2}\right) = \left(\frac{3}{2}, \frac{-1}{2}\right)$

Let $D(x, y)$

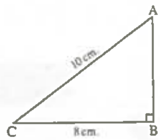
$\therefore \left(\frac{3}{2}, \frac{-1}{2}\right) = \left(\frac{4+x}{2}, \frac{-5+y}{2}\right)$

$\therefore \frac{4+x}{2} = \frac{3}{2}$ $\qquad \therefore 4 + x = 3$ $\qquad \therefore x = -1$

, $\frac{-5+y}{2} = \frac{-1}{2}$ $\qquad \therefore -5 + y = -1$ $\qquad \therefore y = 4$

$\therefore D(-1, 4)$

[b] $\because m(\angle B) = 90°$



$\therefore (AB)^2 = (10)^2 - (8)^2$

$= 36$

$\therefore AB = 6$ cm.

$\therefore \sin^2 A + 1 = \left(\frac{8}{10}\right)^2 + 1 = \frac{41}{25}$ $\qquad (1)$

, $2\cos^2 C + \cos^2 A = 2 \times \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2$

$= \frac{41}{25}$ $\qquad (2)$

From (1) , (2) : $\therefore \sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

4

[a] $\because L_1 \parallel L_2$ $\qquad \therefore m_1 = m_2$

$\therefore \frac{k-1}{2-3} = \tan 45°$

$\therefore -k + 1 = 1$ $\qquad \therefore k = 0$

[b] $\because$ The slope of the given straight line $= \frac{-1}{3}$

$\therefore$ The slope of the required straight line = 3

$\therefore$ Its equation is : $y = 3x + c$

, $\because$ (1 , 2) satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

5

[a] 1 In ΔABC : $\because m(\angle B) = 90°$

$\therefore \sin(\angle ACB) = \frac{15}{25}$

$\therefore m(\angle ACB) \simeq 36° \, 52' \, 12''$

2 $\because (BC)^2 = (25)^2 - (15)^2 = 400$

$\therefore BC = 20$ cm.

$\therefore$ The area $= 20 \times 15 = 300 \text{ cm}^2$.

[b] $\because$ The straight line passes through the two points (4 , 0) , (0 , 9)

$\therefore$ The slope of the straight line $= \frac{9-0}{0-4} = -\frac{9}{4}$

and the intercepted part = 9 units from the positive part of y-axis

$\therefore$ The equation of the straight line is :

$y = -\frac{9}{4}x + 9$

5 El-Sharkia

1

1 b 2 b 3 d 4 a 5 c 6 c

2

[a] $\because \frac{\sin 30° \sin 60°}{\sin 45° \cos 45°} = \frac{\frac{1}{2} \times \frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}} = \frac{\sqrt{3}}{2}$ (1)

, $\cos 30° = \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) : $\therefore \frac{\sin 30° \sin 60°}{\sin 45° \cos 45°} = \cos 30°$

[b] $\because MA = \sqrt{(-1-3)^2 + (2+1)^2} = \sqrt{16+9}$

= 5 length units

, $MB = \sqrt{(-1+4)^2 + (2-6)^2} = \sqrt{9+16}$

= 5 length units

and $MC = \sqrt{(-1-2)^2 + (2+2)^2} = \sqrt{9+16}$

= 5 length units

$\therefore MA = MB = MC$

$\therefore$ A , B and C lie on the circle M

, the circumference $= 2 \times 3.14 \times 5$

= 31.4 length units.

3

[a] The slope of $\overleftrightarrow{BC} = \frac{3+7}{1-3} = -5$

$\therefore$ The slope of the required straight line = – 5

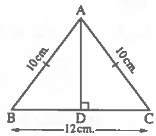
$\therefore$ Its equation is : $y = -5x + c$

, $\because$ A (5 , 1) satisfies the equation.

$\therefore 1 = -5 \times 5 + c$ $\therefore c = 26$

$\therefore$ The equation is : $y = -5x + 26$

[b] Draw $\overline{AD} \perp \overline{BC}$



1 $\because \overline{AD} \perp \overline{BC}$, AC = AB

$\therefore BD = CD = 6$ cm.

In ΔADB :

$\because m(\angle ADB) = 90°$

$\therefore (AD)^2 = (10)^2 - (6)^2 = 64$

$\therefore AD = 8$ cm. $\therefore \sin B = \frac{8}{10}$

2 The area of $\Delta ABC = \frac{1}{2} \times 12 \times 8 = 48 \text{ cm}^2$.

4

[a] 1 $\because$ The midpoint of $\overline{AC} = \left(\frac{3+5}{2}, \frac{3-1}{2}\right)$

= (4 , 1)

$\therefore$ The point of intersection of the two diagonals is : (4 , 1)

2 Let D (x , y)

$\therefore (4, 1) = \left(\frac{2+x}{2}, \frac{-2+y}{2}\right)$

$\therefore \frac{2+x}{2} = 4$ $\therefore x = 6$

, $\frac{-2+y}{2} = 1$ $\therefore y = 4$ $\therefore D = (6, 4)$

[b] $\because$ The slope of the straight line $= \frac{3-5}{0-4} = \frac{1}{2}$

$\therefore$ Its equation is : $y = \frac{1}{2}x + c$

, $\because$ (0 , 3) satisfies the equation.

$\therefore 3 = \frac{1}{2} \times 0 + c$ $\qquad \therefore c = 3$

$\therefore$ The equation is : $y = \frac{1}{2}x + 3$

at $y = 0$ $\qquad \therefore 0 = \frac{1}{2}x + 3$ $\qquad \therefore x = -6$

$\therefore$ The intersection point of the straight line with the x-axis is : (– 6 , 0)

5

[a] 1 $\because \cos x = \sin 30^\circ \cos 60^\circ$

$\therefore \cos x = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$\therefore x \simeq 75^\circ\, 31'\, 21''$

2 $\tan 75^\circ\, 31'\, 21'' \simeq 3.873$

[b] $\because$ The slope of the given straight line $= \frac{-3}{2}$

$\therefore$ The slope of the required straight line $= \frac{2}{3}$

, $\because$ the required straight line cuts 3 units of the positive part of y-axis

$\therefore$ Its equation is : $y = \frac{2}{3}x + 3$

6 El-Monofia

1

1 a 2 d 3 d 4 b 5 b 6 c

2

[a] $\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ - \tan^2 45^\circ$

$= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} - (1)^2$

$= \frac{1}{4} + \frac{3}{4} - 1 = 0$

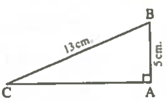
[b] 1 $\because AB = \sqrt{(5-7)^2 + (1+3)^2} = \sqrt{4+16}$

$= 2\sqrt{5}$ length units

$\therefore$ The area $= 3.14 \times \left(\sqrt{5}\right)^2 = 15.7 \text{ cm}^2$

2 $M = \left(\frac{7+5}{2}, \frac{-3+1}{2}\right) = (6, -1)$

3



[a] $\because m(\angle A) = 90^\circ$

$\therefore (AC)^2 = (13)^2 - (5)^2$

$= 144$

$\therefore AC = 12$ cm.

$\therefore \sin C \cos B + \cos C \sin B$

$= \frac{5}{13} \times \frac{5}{13} + \frac{12}{13} \times \frac{12}{13} = 1$

[b] $\because$ The slope of the given straight line $= \frac{1-0}{2-5} = \frac{-1}{3}$

$\therefore$ The slope of the required straight line = 3

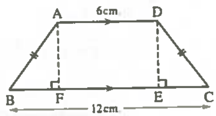
$\therefore$ Its equation is : $y = 3x + c$

, $\because$ (1 , 3) satisfies the equation.

$\therefore 3 = 3 \times 1 + c$ $\qquad \therefore c = 0$

$\therefore$ The equation is : $y = 3x$

4



[a] Draw $\overline{AF} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

$\because \overline{AD} \mathbin{/\!/} \overline{BC}$

, $\overline{AF} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

$\therefore$ ADEF is a rectangle $\qquad \therefore EF = AD = 6$ cm.

$\therefore BF + EC = 6$ cm.

$\therefore BF = EC = 3$ cm. ($\Delta ABF \equiv \Delta DCE$)

$\because$ The area of the trapezium $= \frac{1}{2}(AD + BC) \times AF$

$\therefore 36 = \frac{1}{2}(6 + 12) \times AF$

$\therefore AF = 4$ cm. $\qquad \therefore DE = AF = 4$ cm.

In ΔABF : $\because m(\angle AFB) = 90^\circ$

$\therefore (AB)^2 = (3)^2 + (4)^2 = 25$ $\qquad \therefore AB = 5$ cm.

$\therefore DC = AB = 5$ cm.

$\therefore \sin B + \cos C = \frac{4}{5} + \frac{3}{5} = \frac{7}{5}$

[b] $\because AB = \sqrt{(5+1)^2 + (1-3)^2} = \sqrt{36+4}$

$= \sqrt{40}$ length units

, $BC = \sqrt{(6-5)^2 + (4-1)^2} = \sqrt{1+9}$

$= \sqrt{10}$ length units

, $AC = \sqrt{(6+1)^2 + (4-3)^2} = \sqrt{49+1}$

$= \sqrt{50}$ length units

$\therefore (AC)^2 = 50$

, $(AB)^2 + (BC)^2 = 40 + 10 = 50$

$\therefore (AC)^2 = (AB)^2 + (BC)^2$

$\therefore \Delta ABC$ is a right-angled triangle at B

5

[a] The slope $= \frac{-4}{5}$ and the intercepted part = 2 units from the positive part of the y-axis.

[b] [1] $\because$ The slope of $\overleftrightarrow{CD} = \frac{6-2}{-3-3} = \frac{-2}{3}$

$\therefore$ The equation of $\overleftrightarrow{CD}$ is : $y = \frac{-2}{3}x + c$

, $\because$ A (3 , 2) satisfies the equation.

$\therefore 2 = \frac{-2}{3} \times 3 + c$ $\qquad \therefore c = 4$

$\therefore$ The equation is : $y = \frac{-2}{3}x + 4$

[2] At $x = 0$ $\quad \therefore y = \frac{-2}{3} \times 0 + 4$ $\quad \therefore y = 4$

$\therefore$ OD = 4 units

, at $y = 0$ $\quad \therefore 0 = \frac{-2}{3}x + 4$ $\quad \therefore x = 6$

$\therefore$ OC = 6 units

$\therefore$ The area of Δ DOC $= \frac{1}{2} \times 4 \times 6$

= 12 square units.

7 El-Gharbia

1

[1] c [2] c [3] b [4] b [5] a [6] d

2

[a] $\because \tan x = 4 \cos 60° \sin 30°$

$\therefore \tan x = 4 \times \frac{1}{2} \times \frac{1}{2} = 1$ $\qquad \therefore x = 45°$

[b] [1] $\because \overleftrightarrow{XY} \perp \overleftrightarrow{YZ}$

$\therefore$ The slope of $\overleftrightarrow{XY}$ × the slope of $\overleftrightarrow{YZ} = -1$

$\therefore \frac{2-5}{4-3} \times \frac{a-2}{-5-4} = -1$

$\therefore -3 \times \frac{a-2}{-9} = -1$ $\qquad \therefore a - 2 = -3$

$\therefore a = -1$

[2] $\because XY = \sqrt{(4-3)^2 + (2-5)^2} = \sqrt{1+9}$

$= \sqrt{10}$ length units

, $YZ = \sqrt{(-5-4)^2 + (-1-2)^2} = \sqrt{81+9}$

$= \sqrt{90}$ length units

$\therefore$ The area of Δ XYZ $= \frac{1}{2} \times \sqrt{10} \times \sqrt{90}$

= 15 square units.

3

[a] Let the measures be $3x$, $5x$

$\therefore 3x + 5x = 180°$ $\qquad \therefore 8x = 180°$

$\therefore x = 22° 30'$

$\therefore$ The measures are : 67° 30' , 112° 30'

[b] $\because$ The slope of the given straight line = -1

$\therefore$ The slope of the required straight line = 1

$\therefore$ Its equation is : $y = x + c$

, $\because$ (−1 , 2) satisfies the equation.

$\therefore 2 = -1 + c$ $\qquad \therefore c = 3$

$\therefore$ The equation is : $y = x + 3$

4

[a] $\because MA = \sqrt{(-1-3)^2 + (2+1)^2} = \sqrt{16+9}$

= 5 length units

, $MB = \sqrt{(-1+4)^2 + (2-6)^2} = \sqrt{9+16}$

= 5 length units

and $MC = \sqrt{(-1-2)^2 + (2+2)^2} = \sqrt{9+16}$

= 5 length units

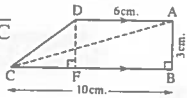
$\therefore$ MA = MB = MC

$\therefore$ A , B and C lie on the circle M

, the circumference $= 2 \times 5 \times \pi$

$= 10\pi$ length units.

[b] Draw $\overline{DF} \perp \overline{BC}$



$\because \overline{AD} \,//\, \overline{BC}$, $\overline{AB} \perp \overline{BC}$

, $\overline{DF} \perp \overline{BC}$

$\therefore$ ABFD is a rectangle

$\therefore$ BF = AD = 6 cm.

$\therefore$ FC = 4 cm. , DF = AB = 3 cm.

$\therefore$ From Δ DFC which is right-angled at F

$(DC)^2 = 3^2 + 4^2 = 25$ $\qquad \therefore$ DC = 5 cm.

$\therefore \cos(\angle DCB) - \tan(\angle ACB) = \frac{4}{5} - \frac{3}{10} = \frac{1}{2}$

5

[a] [1] $\because$ The midpoint of $\overline{AC} = \left(\frac{3+0}{2} , \frac{2-3}{2}\right)$

$= \left(1\frac{1}{2} , -\frac{1}{2}\right)$

$\therefore$ The intersection point of the two diagonals is $\left(1\frac{1}{2} , -\frac{1}{2}\right)$

[2] Let D (x , y)

$\because$ The midpoint of $\overline{AC}$ = the midpoint of $\overline{BD}$

$\therefore \left(1\frac{1}{2} , -\frac{1}{2}\right) = \left(\frac{x+4}{2} , \frac{y-5}{2}\right)$

$\therefore \frac{x+4}{2} = 1\frac{1}{2}$

$\therefore x + 4 = 3$ $\therefore x = -1$

, $\frac{y-5}{2} = -\frac{1}{2}$ $\therefore y - 5 = -1$ $\therefore y = 4$

$\therefore D(-1, 4)$

[b] 1 Let $A(x, 0)$, $B(0, y)$

$\therefore (3, 4) = \left(\frac{x+0}{2}, \frac{0+y}{2}\right)$

$\therefore \frac{x}{2} = 3$ $\therefore x = 6$

, $\frac{y}{2} = 4$ $\therefore y = 8$

$\therefore A(6, 0)$, $B(0, 8)$

2 $\because$ The slope of $\overleftrightarrow{AB} = \frac{8-0}{0-6} = \frac{-4}{3}$

$\therefore$ The equation of $\overleftrightarrow{AB}$ is : $y = \frac{-4}{3}x + c$

, $\because (0, 8)$ satisfies the equation.

$\therefore 8 = \frac{-4}{3} \times 0 + c$ $\therefore c = 8$

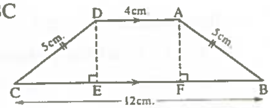
$\therefore$ The equation is : $y = \frac{-4}{3}x + 8$

8 El-Dakahlia

1

[a] 1 c 2 b 3 b

[b] Draw $\overline{AF} \perp \overline{BC}$



, $\overline{DE} \perp \overline{BC}$

$\because \overline{AD} \parallel \overline{BC}$

, $\overline{AF} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

$\therefore$ AFED is a rectangle $\therefore FE = AD = 4$ cm.

$\therefore BF + EC = 8$ cm.

$\because BF = EC = 4$ cm. ($\Delta ABF \equiv \Delta DCE$)

$\therefore$ From ΔABF which is right-angled at F

$(AF)^2 = (5)^2 - (4)^2 = 9$

$\therefore AF = 3$ cm.

$\therefore DE = AF = 3$ cm. (AFED is a rectangle)

$\therefore \frac{\tan B \cos C}{\sin^2 C + \cos^2 B} = \frac{\frac{3}{4} \times \frac{4}{5}}{\left(\frac{3}{5}\right)^2 + \left(\frac{4}{5}\right)^2} = \frac{3}{5}$

2

[a] 1 b 2 b 3 d

[b] 1 $\because MB = \sqrt{(8-5)^2 + (11-7)^2} = \sqrt{9+16}$

$= 5$ length units

$\therefore$ The circumference $= 2 \times 5 \times 3.14$

$= 31.4$ length units.

2 Let $A(x, y)$

$\therefore (5, 7) = \left(\frac{x+8}{2}, \frac{y+11}{2}\right)$

$\therefore \frac{x+8}{2} = 5$ $\therefore x + 8 = 10$ $\therefore x = 2$

, $\frac{y+11}{2} = 7$ $\therefore y + 11 = 14$ $\therefore y = 3$

$\therefore A(2, 3)$

, $\because$ the slope of $\overleftrightarrow{AB} = \frac{11-3}{8-2} = \frac{4}{3}$

$\therefore$ The slope of the required straight line $= \frac{-3}{4}$

$\therefore$ Its equation is : $y = \frac{-3}{4}x + c$

, $\because A(2, 3)$ satisfies the equation.

$\therefore 3 = \frac{-3}{4} \times 2 + c$ $\therefore c = \frac{9}{2}$

$\therefore$ The equation is : $y = \frac{-3}{4}x + \frac{9}{2}$

3

[a] $\because$ The midpoint of $\overline{AC} = \left(\frac{-1+7}{2}, \frac{3+4}{2}\right)$

$= \left(3, \frac{7}{2}\right)$

, the midpoint of $\overline{BD} = \left(\frac{5+1}{2}, \frac{1+6}{2}\right)$

$= \left(3, \frac{7}{2}\right)$

$\therefore$ The midpoint of $\overline{AC}$ = the midpoint of $\overline{BD}$

$\therefore$ The two diagonals bisect each other.

$\therefore$ ABCD is a parallelogram.

[b] 1 Let $A(0, n)$, $B(n, 0)$

$\therefore$ The slope $= \frac{0-n}{n-0} = -1$ $\therefore k = -1$

, $\because (2, 3)$ satisfies the equation.

$\therefore 3 = -1 \times 2 + c$ $\therefore c = 5$

2 $\because A(0, n)$ satisfies the equation.

$\therefore n = -1 \times 0 + 5$ $\therefore n = 5$

$\therefore A(0, 5)$, $B(5, 0)$

$\therefore$ The area of $\Delta ABO = \frac{1}{2} \times 5 \times 5$

$= \frac{25}{2}$ square units.

4

[a] 1 $\because$ The intercepted part of the y-axis by $\overleftrightarrow{BC}$ is 3 units

$\therefore C = (0 , 3)$

$\therefore BC = \sqrt{(0-2)^2 + (3-1)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units.

2 $\because B (2 , 1)$ $\therefore OA = 2$ length units

, AB = 1 length unit

, $\because \overline{AB} // \overline{OC}$, $AB \neq OC$

$\therefore$ OABC is a trapezium

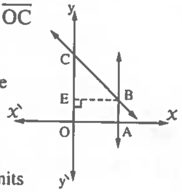
$\therefore$ The area of OABC $= \frac{1}{2}(1+3) \times 2$

= 4 square units.

3 Draw $\overline{BE} \perp \overline{OC}$

$\because \overline{BE} \perp \overline{OC}$, $\overline{AO} \perp \overline{OC}$

, $\overline{AB} // \overline{OC}$



$\therefore$ ABEO is a rectangle

$\therefore OE = AB$

= 1 length unit

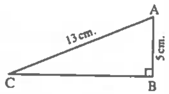
BE = OA = 2 length units

, CE = 3 − 1 = 2 length units.

In Δ BEC : $\because \tan(\angle BCE) = \frac{2}{2} = 1$

$\therefore m(\angle OCB) = 45°$

[b] 1 $\because m(\angle B) = 90°$



$\therefore \sin^2 A + \cos^2 A$

$= \frac{(BC)^2}{(AC)^2} + \frac{(AB)^2}{(AC)^2}$

$= \frac{(BC)^2 + (AB)^2}{(AC)^2} = \frac{(AC)^2}{(AC)^2} = 1$

2 $\because \sin C = \frac{5}{13}$ $\therefore m(\angle C) \simeq 22° \, 37'$

5

[a] $\because$ The slope $= \tan 135° = -1$

$\therefore$ The equation is : $y = -x + c$

, $\because (3 , 4)$ satisfies the equation.

$\therefore 4 = -3 + c$ $\therefore c = 7$

$\therefore$ The equation is : $y = -x + 7$

[b] $\because \tan^2 60° - \tan^2 45° = \left(\sqrt{3}\right)^2 - (1)^2$

$= 3 - 1 = 2$ (1)

, $\sin^2 60° + \cos^2 60° + 2 \sin 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 + 2 \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4} + 1 = 2$ (2)

From (1) , (2) :

$\therefore \tan^2 60° - \tan^2 45° = \sin^2 60° + \cos^2 60° + 2 \sin 30°$

9 Ismailia

1

1 a 2 c 3 b 4 a 5 c 6 d

2

[a] $\because x \cos^2 30° = \tan^2 60° \cos^2 45°$

$\therefore x \times \left(\frac{\sqrt{3}}{2}\right)^2 = \left(\sqrt{3}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2$

$\therefore \frac{3}{4} x = 3 \times \frac{1}{2}$ $\therefore x = 2$

[b] $\because$ The midpoint of $\overline{BC} = \left(\frac{3+1}{2} , \frac{7-3}{2}\right) = (2 , 2)$

$\therefore$ The slope of the required straight line $= \frac{-1-2}{5-2}$

$= -1$

$\therefore$ Its equation is : $y = -x + c$

, $\because A (5 , -1)$ satisfies the equation.

$\therefore -1 = -5 + c$ $\therefore c = 4$

$\therefore$ The equation is : $y = -x + 4$

3

[a] $\because AB = \sqrt{(-4-1)^2 + (2+2)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

, $BC = \sqrt{(1+4)^2 + (6-2)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

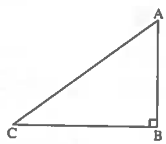
, $AC = \sqrt{(1-1)^2 + (6+2)^2} = \sqrt{0+64}$

= 8 length units

$\therefore AB = BC$

$\therefore \Delta$ ABC is an isosceles triangle.

[b] $\because m(\angle B) = 90°$



$\therefore \frac{\sin A}{\cos C} = \frac{\frac{BC}{AC}}{\frac{BC}{AC}} = 1$

, $\because \tan D = \frac{\sin A}{\cos C} = 1$

$\therefore m(\angle D) = 45°$

4

[a] $\because L_1 \parallel L_2$ $\quad \therefore m_1 = m_2$

$\therefore \frac{1-4}{k-2} = \tan 45°$ $\quad \therefore \frac{-3}{k-2} = 1$

$\therefore k - 2 = -3$ $\quad \therefore k = -1$

[b] In Δ BED :

$\because m(\angle BED) = 90°$, $m(\angle B) = 60°$

$\therefore m(\angle BDE) = 30°$, $BE = \frac{1}{2} BD = 2$ cm.

, $\because \sin 60° = \frac{DE}{BD}$ $\quad \therefore \frac{\sqrt{3}}{2} = \frac{DE}{4}$

$\therefore DE = 2\sqrt{3}$ cm.

In Δ CDE :

$\because m(\angle CED) = 90°$, $CE = 5 - 2 = 3$ cm.

$\therefore \tan(\angle DCE) = \frac{2\sqrt{3}}{3}$

5

[a] 1 The midpoint of $\overline{AC} = \left(\frac{3-3}{2} , \frac{3-3}{2}\right) = (0 , 0)$

$\therefore$ The intersection point of the diagonals is : $(0 , 0)$

2 $\because$ The slope of $\overleftrightarrow{AC} = \frac{-3-3}{-3-3} = 1$

, $\because \overleftrightarrow{AC} \perp \overleftrightarrow{BD}$

$\therefore$ The slope of $\overleftrightarrow{BD} = -1$

, $\because \overleftrightarrow{BD}$ passes through $(0 , 0)$

$\therefore$ The equation of $\overleftrightarrow{BD}$ is : $y = -x$

[b] $\because A(0 , 2)$, $B(4 , 0)$, $C(-1 , 0)$

$\therefore$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{2-0}{0-4} = \frac{-1}{2}$

, the slope of $\overleftrightarrow{AC} = m_2 = \frac{0-2}{-1-0} = 2$

$\therefore m_1 \times m_2 = \frac{-1}{2} \times 2 = -1$

$\therefore \overleftrightarrow{AB} \perp \overleftrightarrow{AC}$

$\therefore \Delta ABC$ is a right-angled triangle at A

, its area $= \frac{1}{2} \times 2 \times 5 = 5$ square units.

10 Suez

1

1 d $\quad$ 2 a $\quad$ 3 c $\quad$ 4 d $\quad$ 5 b $\quad$ 6 a

2

[a] $\because 2 \sin 30° + 4 \cos 60° = 2 \times \frac{1}{2} + 4 \times \frac{1}{2} = 3$ (1)

, $\tan^2 60° = \left(\sqrt{3}\right)^2 = 3$ (2)

From (1) , (2) :

$\therefore 2 \sin 30° + 4 \cos 60° = \tan^2 60°$

[b] $\because$ The midpoint of $\overline{AC} = \left(\frac{-1+6}{2} , \frac{-1+0}{2}\right) = \left(\frac{5}{2} , \frac{-1}{2}\right)$

, the midpoint of $\overline{BD} = \left(\frac{2+3}{2} , \frac{3-4}{2}\right) = \left(\frac{5}{2} , \frac{-1}{2}\right)$

$\therefore$ The midpoint of $\overline{AC}$ = the midpoint of $\overline{BD}$

$\therefore \overline{AC}$ and $\overline{BD}$ bisect each other.

3

[a] $\because \cos 3x = \frac{\sin 60° \sin 30°}{\tan 45° \sin^2 45°} = \frac{\frac{\sqrt{3}}{2} \times \frac{1}{2}}{1 \times \left(\frac{1}{\sqrt{2}}\right)^2} = \frac{\frac{\sqrt{3}}{4}}{\frac{1}{2}} = \frac{\sqrt{3}}{2}$

$\therefore 3x = 30°$ $\quad \therefore x = 10°$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{-4+3}{5-2} = \frac{-1}{3}$

$\therefore$ The slope of the required straight line = 3

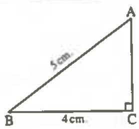
$\therefore$ Its equation is : $y = 3x + c$

, $\because (1 , 2)$ satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\quad \therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

4



[a] $\because m(\angle C) = 90°$

$\therefore (AC)^2 = (5)^2 - (4)^2 = 9$

$\therefore AC = 3$ cm.

$\therefore \sin A \cos B + \cos A \sin B = \frac{4}{5} \times \frac{4}{5} + \frac{3}{5} \times \frac{3}{5}$
$= 1$

[b] $\because \frac{y-1}{x} = \frac{1}{3}$ $\quad \therefore y = \frac{1}{3} x + 1$

$\therefore$ The slope of the given straight line $= \frac{1}{3}$

$\therefore$ The slope of the required straight line $= \frac{1}{3}$

, $\because$ it intersects a part from the negative direction of the y-axis of length 3 units

$\therefore$ The equation is : $y = \frac{1}{3}x - 3$

5

[a] $\because AB = \sqrt{(3-0)^2+(4-0)^2} = \sqrt{9+16}$

$= 5$ length units

, $BC = \sqrt{(-4-3)^2+(3-4)^2} = \sqrt{49+1}$

$= 5\sqrt{2}$ length units

, $AC = \sqrt{(-4-0)^2+(3-0)^2} = \sqrt{16+9}$

$= 5$ length units

$\therefore$ The perimeter of $\Delta ABC = 5 + 5\sqrt{2} + 5$

$= 10 + 5\sqrt{2}$ length units.

[b] $\because \overline{AB} \parallel \overline{CD}$ $\quad\therefore m_1 = m_2$

$\therefore \frac{2+2}{3-9} = \frac{-3+x}{4+x}$ $\quad\therefore \frac{-2}{3} = \frac{-3+x}{4+x}$

$\therefore -9+3x = -8-2x$ $\quad\therefore 5x = 1$

$\therefore x = \frac{1}{5}$ $\quad\therefore C\left(\frac{-1}{5}, \frac{-1}{5}\right)$

11 Port Said

1

1 a 2 b 3 c 4 b 5 d 6 b

2

[a] $\because m_1 = \frac{4-3}{2+1} = \frac{1}{3}$

, $m_2 = \frac{1}{3}$ $\quad\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] $\because \sin 90° = 1$ (1)

, $\sin 60° \cos 30° + \cos 60° \sin 30°$

$= \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \frac{1}{2} = 1$ (2)

From (1) , (2) :

$\therefore \sin 90° = \sin 60° \cos 30° + \cos 60° \sin 30°$

3

[a] $\because \cos E = \frac{\cos^2 45°}{\tan 30°} = \frac{\left(\frac{1}{\sqrt{2}}\right)^2}{\frac{1}{\sqrt{3}}} = \frac{\sqrt{3}}{2}$

$\therefore m(\angle E) = 30°$

[b] $\because AB = \sqrt{(3+3)^2+(4-0)^2} = \sqrt{36+16}$

$= 2\sqrt{13}$ length units

, $BC = \sqrt{(1-3)^2+(-6-4)^2} = \sqrt{4+100}$

$= 2\sqrt{26}$ length units

, $AC = \sqrt{(1+3)^2+(-6-0)^2} = \sqrt{16+36}$

$= 2\sqrt{13}$ length units

$\therefore AB = AC$ $\quad\therefore \Delta ABC$ is an isosceles triangle.

4

[a] $\because \frac{y-1}{x} = \frac{1}{3}$ $\quad\therefore y = \frac{1}{3}x + 1$

$\therefore$ The slope of the given straight line $= \frac{1}{3}$

$\therefore$ The slope of the required straight line $= \frac{1}{3}$

, $\because$ it intercepts a part from the negative direction of the y-axis of length 3 units

$\therefore$ The equation is : $y = \frac{1}{3}x - 3$

[b] $\because$ The slope of $\overleftrightarrow{AD} = \frac{1-3}{-2-2} = \frac{1}{2}$

, the slope of $\overleftrightarrow{BC} = \frac{2+2}{6+2} = \frac{1}{2}$

$\therefore$ The slope of $\overleftrightarrow{AD}$ = the slope of $\overleftrightarrow{BC}$

$\therefore \overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$ (1)

, $\because$ the slope of $\overleftrightarrow{AB} = \frac{2-3}{6-2} = \frac{-1}{4}$

, the slope of $\overleftrightarrow{CD} = \frac{1+2}{-2+2}$ is undefined

$\therefore$ The slope of $\overleftrightarrow{AB} \neq$ the slope of $\overleftrightarrow{CD}$

$\therefore \overleftrightarrow{AB}$ is not parallel to $\overleftrightarrow{CD}$ (2)

From (1) , (2) :

$\therefore$ ABCD is a trapezoid.

5

[a] $\because$ The midpoint of $\overline{BC} = \left(\frac{3+1}{2}, \frac{7-3}{2}\right) = (2, 2)$

$\therefore$ The slope of the straight line $= \frac{2+6}{2-5} = \frac{-8}{3}$

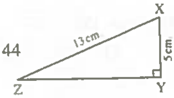
$\therefore$ Its equation is : $y = \frac{-8}{3}x + c$

, $\because (5, -6)$ satisfies the equation.

$\therefore -6 = \frac{-8}{3} \times 5 + c$ $\quad\therefore c = \frac{22}{3}$

$\therefore$ The equation is : $y = \frac{-8}{3}x + \frac{22}{3}$

[b] $\because m(\angle Y) = 90^\circ$



$\therefore (YZ)^2 = (13)^2 - (5)^2 = 144$

$\therefore YZ = 12$ cm.

$\therefore \sin X \cos Z + \cos X \sin Z$

$= \frac{12}{13} \times \frac{12}{13} + \frac{5}{13} \times \frac{5}{13} = 1$

12 Damietta

1

1 a 2 d 3 d 4 c 5 b 6 d

2

[a] $\because$ The slope of the straight line $= \frac{5-0}{0-5} = -1$

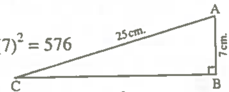
$\therefore$ Its equation is : $y = -x + c$

, $\because (0, 5)$ satisfies the equation.

$\therefore 5 = 0 + c$ $\therefore c = 5$

$\therefore$ The equation is : $y = -x + 5$

[b] $\because m(\angle B) = 90^\circ$



$\therefore (BC)^2 = (25)^2 - (7)^2 = 576$

$\therefore BC = 24$ cm.

$\therefore \sin^2 A + \sin^2 C = \left(\frac{24}{25}\right)^2 + \left(\frac{7}{25}\right)^2 = 1$

3

[a] $\because$ The points are located on one straight line

$\therefore \frac{3-1}{a-0} = \frac{5-1}{2-0}$ $\therefore \frac{2}{a} = 2$ $\therefore a = 1$

[b] $\because$ The slope of the given straight line $= \frac{-1}{3}$

$\therefore$ The slope of the required straight line $= \frac{-1}{3}$

$\therefore$ Its equation is : $y = \frac{-1}{3} x + c$

, $\because (3, 7)$ satisfies the equation.

$\therefore 7 = \frac{-1}{3} \times 3 + c$ $\therefore c = 8$

$\therefore$ The equation is : $y = \frac{-1}{3} x + 8$

4

[a] $\because 2 \sin x = \sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ$

$\therefore 2 \sin x = \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\therefore 2 \sin x = 1$ $\therefore \sin x = \frac{1}{2}$

$\therefore x = 30^\circ$

[b] $\because$ The slope of the straight line = 2 and it intersects from the positive part of y-axis 7 units.

$\therefore$ Its equation is : $y = 2x + 7$

5

[a] $\because \tan 60^\circ = \sqrt{3}$ (1)

, $\frac{2 \tan 30^\circ}{1 - \tan^2 30^\circ} = \frac{2 \times \frac{1}{\sqrt{3}}}{1 - \left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}} = \sqrt{3}$ (2)

From (1) , (2) :

$\therefore \tan 60^\circ = \frac{2 \tan 30^\circ}{1 - \tan^2 30^\circ}$

[b] $\because AB = \sqrt{(-2-3)^2 + (4+1)^2} = \sqrt{25 + 25}$

$= 5\sqrt{2}$ length units

, $BC = \sqrt{(3-4)^2 + (-1-5)^2} = \sqrt{1 + 36}$

$= \sqrt{37}$ length units

, $AC = \sqrt{(-2-4)^2 + (4-5)^2} = \sqrt{36 + 1}$

$= \sqrt{37}$ length units

$\therefore BC = AC$

$\therefore \Delta ABC$ is an isosceles triangle.

13 Kafr El-Sheikh

1

1 c 2 a 3 b 4 d 5 c 6 d

2

[a] $\because AB = \sqrt{(3-1)^2 + (0-4)^2} = \sqrt{4 + 16}$

$= 2\sqrt{5}$ length units

, $BC = \sqrt{(1+1)^2 + (4-2)^2} = \sqrt{4 + 4}$

$= 2\sqrt{2}$ length units

, $AC = \sqrt{(3+1)^2 + (0-2)^2} = \sqrt{16 + 4}$

$= 2\sqrt{5}$ length units

$\therefore AB = AC$

$\therefore \Delta ABC$ is an isosceles triangle.

[b] $\sin^2 45^\circ \cos 60^\circ + \frac{1}{2} \tan 60^\circ \sin 60^\circ$

$= \left(\frac{1}{\sqrt{2}}\right)^2 \times \frac{1}{2} + \frac{1}{2} \times \sqrt{3} \times \frac{\sqrt{3}}{2}$

$= \frac{1}{4} + \frac{3}{4} = 1$

3

[a] $\because L_1 // L_2$ $\therefore m_1 = m_2$

$\therefore 2 - k = \tan 45°$ $\therefore 2 - k = 1$

$\therefore k = 1$

[b] $\because \sqrt{3}\tan X = 4\sin 60° \cos 30°$

$\therefore \sqrt{3}\tan X = 4 \times \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\therefore \sqrt{3}\tan X = 3$ $\therefore \tan X = \sqrt{3}$

$\therefore X = 60°$

4

[a] $\because \sqrt{(2-X)^2 + (5-3)^2} = 2\sqrt{2}$ (Squaring both sides)

$\therefore (2-X)^2 + (2)^2 = 8$

$\therefore X^2 - 4X + 4 + 4 = 8$ $\therefore X^2 - 4X = 0$

$\therefore X(X-4) = 0$ $\therefore X = 0$ or $X = 4$

[b] $\because$ The slope $= 3$

$\therefore$ The equation is : $y = 3X + c$

, $\because (5, -2)$ satisfies the equation.

$\therefore -2 = 3 \times 5 + c$ $\therefore c = -17$

$\therefore$ The equation is : $y = 3X - 17$

5

[a] Let $B(X, y)$

$\therefore (2, 3) = \left(\frac{X-1}{2}, \frac{y+3}{2}\right)$

$\therefore \frac{X-1}{2} = 2$ $\therefore X - 1 = 4$ $\therefore X = 5$

, $\frac{y+3}{2} = 3$ $\therefore y + 3 = 6$ $\therefore y = 3$

$\therefore B(5, 3)$

[b] $\because \angle A, \angle C$ are complementary angles

$\therefore \sin A = \cos C$

$\therefore \sin A + \cos C = \sin A + \sin A = 1$

$\therefore \sin A = \frac{1}{2}$ $\therefore m(\angle A) = 30°$

14 El-Beheira

1

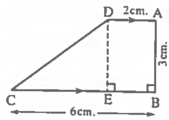
1 c　2 b　3 b　4 b　5 b　6 c

2

[a] $\because m_1 = \frac{4-3}{2+1} = \frac{1}{3}$, $m_2 = \frac{1}{3}$ $\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] Draw $\overline{DE} \perp \overline{BC}$



$\because \overline{AD} // \overline{BC}$, $\overline{AB} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

$\therefore ABED$ is a rectangle

$\therefore DE = AB = 3$ cm.

, $BE = AD = 2$ cm. $\therefore CE = 6 - 2 = 4$ cm.

In ΔDEC : $\because m(\angle DEC) = 90°$

$\therefore (DC)^2 = (3)^2 + (4)^2 = 25$ $\therefore DC = 5$ cm.

$\therefore \cos(\angle BCD) = \frac{4}{5}$

3

[a] $\because$ The slope $= 3$

$\therefore$ The equation is : $y = 3X + c$

, $\because (1, 2)$ satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\therefore c = -1$

$\therefore$ The equation is : $y = 3X - 1$

[b] $\because 2\sin X = \tan^2 60° - 2\tan 45°$

$\therefore 2\sin X = \left(\sqrt{3}\right)^2 - 2 \times 1$ $\therefore 2\sin X = 1$

$\therefore \sin X = \frac{1}{2}$ $\therefore X = 30°$

4

[a] $\because L_1 \perp L_2$ $\therefore m_1 \times m_2 = -1$

$\therefore \frac{k-1}{2-3} \times \tan 45° = -1$ $\therefore (1-k) \times 1 = -1$

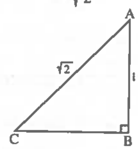
$\therefore 1 - k = -1$ $\therefore k = 2$

[b] $\because \sqrt{2}\,AB = AC$ $\therefore \frac{AB}{AC} = \frac{1}{\sqrt{2}}$

Let $AB = 1$ length unit

, $AC = \sqrt{2}$ length unit

, $\because m(\angle B) = 90°$



$\therefore (BC)^2 = \left(\sqrt{2}\right)^2 - (1)^2 = 1$

$\therefore BC = 1$ length unit

$\therefore \sin C = \frac{1}{\sqrt{2}}$, $\cos C = \frac{1}{\sqrt{2}}$, $\tan C = 1$

5

[a] $\because AB = BC$

$\therefore \sqrt{(X-3)^2 + (3-2)^2} = \sqrt{(3-5)^2 + (2-1)^2}$

(Squaring both sides)

$\therefore (X-3)^2 + 1 = 4 + 1$

$\therefore X^2 - 6X + 9 + 1 - 4 - 1 = 0$

$\therefore X^2 - 6X + 5 = 0$ $\therefore (X-5)(X-1) = 0$

$\therefore X = 5$ or $X = 1$ (refused because $B \notin \overleftrightarrow{AC}$)

[b] $\because AB = \sqrt{(2-6)^2+(-4-0)^2}$

$= \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$ length unit

, $BC = \sqrt{(-4-2)^2+(2+4)^2} = \sqrt{36+36} = \sqrt{72}$

$= 6\sqrt{2}$ length unit

, $CA = \sqrt{(6+4)^2+(0-2)^2} = \sqrt{100+4} = \sqrt{104}$

$= 2\sqrt{26}$ length unit

$\therefore (AB)^2 + (BC)^2 = 32 + 72 = 104 = (CA)^2$

$\therefore \Delta ABC$ is right-angled at B

Let E be the midpoint of $\overline{AC}$

$\therefore E = \left(\frac{6-4}{2} , \frac{0+2}{2}\right) = (1 , 1)$

$\because$ In the rectangle the two diagonals bisect each other

$\therefore$ E is the midpoint of $\overline{BD}$

Let D (x , y)

$\therefore (1 , 1) = \left(\frac{x+2}{2} , \frac{y-4}{2}\right)$ $\qquad \therefore \frac{x+2}{2} = 1$

$\therefore x + 2 = 2$ $\qquad \therefore x = 0$

, $\frac{y-4}{2} = 1$ $\qquad \therefore y - 4 = 2$

$\therefore y = 6$ $\qquad \therefore D (0 , 6)$

15 El-Fayoum

1

1 b 2 d 3 c 4 c 5 c 6 c

2

[a] $\because MA = \sqrt{(-1-3)^2+(2+1)^2} = \sqrt{16+9}$

$= 5$ length units

, $MB = \sqrt{(-1+4)^2+(2-6)^2} = \sqrt{9+16}$

$= 5$ length units

and $MC = \sqrt{(-1-2)^2+(2+2)^2} = \sqrt{9+16}$

$= 5$ length units

$\therefore MA = MB = MC$

$\therefore$ A , B and C lie on the circle M

, the circumference $= 2 \times 3.14 \times 5$

$= 31.4$ length units.

[b] $\because \tan^2 60° - \tan^2 45° = \left(\sqrt{3}\right)^2 - (1)^2 = 2$ (1)

, $\because \sin^2 60° + \cos^2 60° + 2 \sin 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 + 2 \times \frac{1}{2} = 2$ (2)

From (1) , (2) :

$\therefore \tan^2 60° - \tan^2 45° = \sin^2 60° + \cos^2 60° + 2 \sin 30°$

3

[a] $\because$ The slope of $\overleftrightarrow{AB} = \frac{5-3}{3-1} = 1$

$\therefore$ The slope of the required straight line $= -1$

$\therefore$ Its equation is : $y = -x + c$

, $\because$ the midpoint of $\overline{AB}$

$= \left(\frac{1+3}{2} , \frac{3+5}{2}\right) = (2 , 4)$

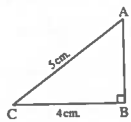
, $\because$ the required straight line passes through the midpoint of $\overline{AB}$

$\therefore 4 = -2 + c$ $\qquad \therefore c = 6$

$\therefore$ The equation of the required straight line is :

$y = -x + 6$

[b] $\because m (\angle B) = 90°$



$\therefore (AB)^2 = (5)^2 - (4)^2 = 9$

$\therefore AB = 3$ cm.

$\therefore 2 \cos^2 C + \sin^2 A$

$= 2\left(\frac{4}{5}\right)^2 + \left(\frac{4}{5}\right)^2 = \frac{48}{25}$

4

[a] $\because$ The midpoint of $\overline{AC} = \left(\frac{3}{} \quad , \frac{-2-7}{2}\right)$

$= \left(\frac{3}{2} \quad \frac{9}{}\right)$

, the midpoint of $\overline{BD} = \left(\frac{-5+8}{2} , \frac{-9}{2}\right)$

$= \left(\frac{3}{2} , \frac{-9}{2}\right)$

$\therefore$ The midpoint of $\overline{AC}$ = the midpoint of $\overline{BD}$

$\therefore \overline{AC}$ and $\overline{BD}$ bisect each other

$\therefore$ The points A , B , C and D are the vertices of a parallelogram.

[b] $\because 4x = \cos^2 30° \tan^2 30° \tan^2 45°$

$\therefore 4x = \left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{1}{\sqrt{3}}\right)^2 \times (1)^2$

$\therefore 4x = \frac{3}{4} \times \frac{1}{3} \times 1$ $\qquad \therefore 4x = \frac{1}{4}$ $\qquad \therefore x = \frac{1}{16}$

5

[a] $\because$ The two straight lines are perpendicular

$\therefore m_1 \times m_2 = -1$ $\qquad \therefore \frac{3}{4} \times \frac{-4}{k} = -1$

$\therefore \frac{3}{k} = 1$ $\qquad \therefore k = 3$

[b] $\because$ The straight line passes through (1 , 0) , (0 , 4)

$\therefore$ Its slope $= \frac{4-0}{0-1} = -4$

$\therefore$ Its equation is : $y = -4x + c$

, $\because$ (0 , 4) satisfies the equation.

$\therefore 4 = -4 \times 0 + c$ $\qquad \therefore c = 4$

$\therefore$ The equation is : $y = -4x + 4$

16 Beni Suef

1

1 b 2 c 3 d 4 a 5 d 6 b

2

[a] Let B (x , y)

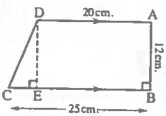
$\therefore (6 , -4) = \left(\frac{5+x}{2} , \frac{-3+y}{2}\right)$

$\therefore \frac{5+x}{2} = 6$ $\qquad \therefore 5 + x = 12$ $\qquad \therefore x = 7$

, $\frac{-3+y}{2} = -4$ $\qquad \therefore -3 + y = -8$ $\quad \therefore y = -5$

$\therefore$ B (7 , −5)

[b] Draw $\overline{DE} \perp \overline{BC}$



, $\because \overline{AD} \mathbin{/\!/} \overline{BC}$, $\overline{AB} \perp \overline{BC}$

, $\overline{DE} \perp \overline{BC}$

$\therefore$ ABED is a rectangle

$\therefore$ DE = AB = 12 cm.

, BE = AD = 20 cm. $\qquad \therefore$ CE = 25 − 20 = 5 cm.

In Δ DEC : $\because m(\angle DEC) = 90°$

$\therefore (DC)^2 = (12)^2 + (5)^2 = 169$

$\therefore$ DC = 13 cm. $\qquad$, $\because \tan C = \frac{12}{5}$

$\therefore m(\angle C) \simeq 67° \, 22' \, 48''$

3

[a] $\because \frac{1}{2} \sin 60° = \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$ $\qquad$ (1)

, $\sin 30° \cos 30° = \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$ $\qquad$ (2)

From (1) , (2) :

$\therefore \frac{1}{2} \sin 60° = \sin 30° \cos 30°$

[b] $\because$ The slope = 2

$\therefore$ The equation of the straight line is : $y = 2x + c$

, $\because$ (2 , 3) satisfies the equation.

$\therefore 3 = 2 \times 2 + c$ $\qquad \therefore c = -1$

$\therefore$ The equation is : $y = 2x - 1$

4

[a] $\because \cos E \tan 30° = \sin^2 45°$

$\therefore \cos E \times \frac{1}{\sqrt{3}} = \left(\frac{1}{\sqrt{2}}\right)^2$

$\therefore \cos E = \frac{\sqrt{3}}{2}$ $\qquad \therefore m(\angle E) = 30°$

[b] $\because m_1 = \frac{3+1}{6-2} = 1$, $m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

5

[a] $\because MA = \sqrt{(-1-3)^2 + (2+1)^2} = \sqrt{16+9}$

= 5 length units

, $MB = \sqrt{(-1+4)^2 + (2-6)^2} = \sqrt{9+16}$

= 5 length units

and $MC = \sqrt{(-1-2)^2 + (2+2)^2} = \sqrt{9+16}$

= 5 length units

$\therefore$ MA = MB = MC

$\therefore$ A , B and C are located on the circle M

[b] The slope $= \frac{2}{3}$

and the intersected part $= \frac{5}{3}$ units

from the negative direction of the y-axis.

17 El-Menia

1

1 b 2 b 3 c 4 d 5 b 6 d

2

[a] $\cos 60° \sin 30° - \sin 60° \tan 60° + \cos^2 30°$

$= \frac{1}{2} \times \frac{1}{2} - \frac{\sqrt{3}}{2} \times \sqrt{3} + \left(\frac{\sqrt{3}}{2}\right)^2$

$= \frac{1}{4} - \frac{3}{2} + \frac{3}{4} = -\frac{1}{2}$

[b] $\because$ The slope of the given straight line

$= \frac{-4+3}{5-2} = \frac{-1}{3}$

$\therefore$ The slope of the required straight line = 3

$\therefore$ Its equation is : $y = 3x + c$

, $\because$ (1 , 2) satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\qquad \therefore c = -1$

$\therefore$ The equation is : $y = 3x - 1$

3

[a] $\because 2 \sin x = \tan^2 60° - 2 \tan 45°$

$\therefore 2 \sin x = \left(\sqrt{3}\right)^2 - 2 \times 1$ $\qquad \therefore 2 \sin x = 1$

$\therefore \sin x = \frac{1}{2}$ $\qquad \therefore x = 30°$

[b] $\because m(\angle A) = 90°$

$\therefore (AB)^2 = (25)^2 - (15)^2 = 400$

$\therefore AB = 20$ cm.

$\therefore \cos C \cos B - \sin C \sin B = \frac{15}{25} \times \frac{20}{25} - \frac{20}{25} \times \frac{15}{25}$
$= 0$

4

[a] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{0+4}{1+1} = 2$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{2-0}{2-1} = 2$

$\therefore m_1 = m_2$ $\qquad \therefore \overleftrightarrow{AB} \,//\, \overleftrightarrow{BC}$

, $\because$ B is a common point

$\therefore$ A , B , C are collinear.

[b] Let B (x , y) $\qquad \therefore (6 , -4) = \left(\frac{5+x}{2} , \frac{-3+y}{2}\right)$

$\therefore \frac{5+x}{2} = 6$ $\qquad \therefore 5 + x = 12$ $\qquad \therefore x = 7$

, $\frac{-3+y}{2} = -4$ $\qquad \therefore -3 + y = -8$ $\qquad \therefore y = -5$

$\therefore$ B $(7 , -5)$

5

[a] $\because m_1 = \tan 45° = 1$ $\quad , \quad m_2 = 1$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] $\because \sqrt{(a+2)^2 + (7-3)^2} = 5$ (Squaring both sides)

$\therefore (a+2)^2 + (4)^2 = 25$

$\therefore a^2 + 4a + 4 + 16 - 25 = 0$

$\therefore a^2 + 4a - 5 = 0$ $\qquad \therefore (a-1)(a+5) = 0$

$\therefore a = 1$ or $a = -5$

18 Assiut

1

1 c   2 d   3 c   4 a   5 c   6 b

2

[a] $\because m(\angle C) = 90°$

$\therefore (AC)^2 = (13)^2 - (12)^2 = 25$

$\therefore AC = 5$ cm.

$\therefore \sin A \cos B + \cos A \sin B = \frac{12}{13} \times \frac{12}{13} + \frac{5}{13} \times \frac{5}{13}$
$= 1$

[b] $\because AB = \sqrt{(5-1)^2 + (1-1)^2} = \sqrt{16} = 4$ length units

, $BC = \sqrt{(3-5)^2 + (4-1)^2} = \sqrt{4+9}$
$= \sqrt{13}$ length units

, $AC = \sqrt{(3-1)^2 + (4-1)^2} = \sqrt{4+9} = \sqrt{13}$ length units.

$\therefore BC = AC$ $\qquad \therefore \Delta ABC$ is isosceles.

3

[a] $\because 2 \sin x = \tan^2 60° - 4 \sin 30°$

$\therefore 2 \sin x = \left(\sqrt{3}\right)^2 - 4 \times \frac{1}{2}$ $\qquad \therefore 2 \sin x = 1$

$\therefore \sin x = \frac{1}{2}$ $\qquad \therefore x = 30°$

[b] $\because$ The midpoint of $\overline{AC} = \left(\frac{3+1}{2} , \frac{2+4}{2}\right) = (2 , 3)$

$\therefore$ The point of intersection of the diagonals is : $(2 , 3)$

Let D (x , y)

$\therefore (2 , 3) = \left(\frac{4+x}{2} , \frac{-5+y}{2}\right)$

$\therefore \frac{4+x}{2} = 2$ $\qquad \therefore 4 + x = 4$ $\qquad \therefore x = 0$

, $\frac{-5+y}{2} = 3$

$\therefore -5 + y = 6$ $\qquad \therefore y = 11$ $\qquad \therefore$ D $(0 , 11)$

4

[a] $\cos 60° + \cos^2 30° + \tan^2 45°$

$= \frac{1}{2} + \left(\frac{\sqrt{3}}{2}\right)^2 + (1)^2 = \frac{1}{2} + \frac{3}{4} + 1 = \frac{9}{4}$

[b] $\because m_1 = \frac{4-3}{\sqrt{3} - 2\sqrt{3}} = \frac{-1}{\sqrt{3}}$ $\quad , \quad m_2 = \tan 60° = \sqrt{3}$

$\therefore m_1 \times m_2 = \frac{-1}{\sqrt{3}} \times \sqrt{3} = -1$

$\therefore$ The two straight lines are perpendicular.

5

[a] $\because$ The slope of the given straight line $= \frac{-1}{3}$

$\therefore$ The slope of the required straight line $= \frac{-1}{3}$

$\therefore$ Its equation is : $y = \frac{-1}{3} x + c$

, $\because$ $(3 , -5)$ satisfies the equation.

$\therefore -5 = \frac{-1}{3} \times 3 + c \qquad \therefore c = -4$

$\therefore$ The equation is : $y = \frac{-1}{3} x - 4$

[b] $\because \frac{y-1}{x} = \frac{1}{2}$

$\therefore y = \frac{1}{2} x + 1$

$\therefore$ The slope $= \frac{1}{2}$ and the intercepted part equals 1 unit from the positive direction of the y-axis.

19 Souhag

1

[1] c   [2] b   [3] d   [4] a   [5] c   [6] d

2

[a] $\because \cos x = 2\cos^2 30° - 1$

$\therefore \cos x = 2 \times \left(\frac{\sqrt{3}}{2}\right)^2 - 1 \qquad \therefore \cos x = 2 \times \frac{3}{4} - 1$

$\therefore \cos x = \frac{1}{2} \qquad \therefore x = 60°$

[b] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{-2-4}{-1-1} = 3$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{-3+2}{2+1} = \frac{-1}{3}$

$\therefore m_1 \times m_2 = 3 \times \frac{-1}{3} = -1 \qquad \therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

$\therefore \Delta ABC$ is right-angled at B

3

[a] [1] $\because m(\angle C) = 90°$

$\therefore (AC)^2 = (13)^2 - (12)^2 = 25 \qquad \therefore AC = 5$ cm.

[2] $\sin A \cos B + \cos A \sin B$

$= \frac{12}{13} \times \frac{12}{13} + \frac{5}{13} \times \frac{5}{13} = 1$

[b] $\because$ The slope $= 2$

$\therefore$ The equation of the straight line is : $y = 2x + c$

, $\because (1 , 0)$ satisfies the equation.

$\therefore 0 = 2 \times 1 + c \qquad \therefore c = -2$

$\therefore$ The equation is : $y = 2x - 2$

4

[a] $\because 2\sin 30° = 2 \times \frac{1}{2} = 1 \qquad (1)$

, $\tan^2 60° - 2\tan 45° = \left(\sqrt{3}\right)^2 - 2 \times 1 = 1 \qquad (2)$

From (1) , (2) : $\therefore 2\sin 30° = \tan^2 60° - 2\tan 45°$

[b] $\because$ The slope of the straight line $= \frac{-3-3}{-1-1} = 3$

$\therefore$ Its equation is : $y = 3x + c$

, $\because (1 , 3)$ satisfies the equation.

$\therefore 3 = 3 \times 1 + c \qquad \therefore c = 0$

$\therefore$ The equation is : $y = 3x$

, $\because c = 0$

$\therefore$ The straight line passes through the origin point.

5

[a] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{5+1}{6+3} = \frac{2}{3}$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{3-5}{3-6} = \frac{2}{3}$

$\therefore m_1 = m_2 \qquad \therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

, $\because$ B is a common point

$\therefore$ A , B , C are collinear.

[b] $\because m_1 = \frac{5+2}{4+3} = 1 \quad , \quad m_2 = \tan 45° = 1$

$\therefore m_1 = m_2$

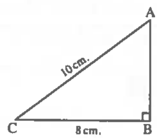
$\therefore$ The two straight lines are parallel.

20 Qena

1

[1] b   [2] c   [3] a   [4] b   [5] c   [6] b

2



[a] $\because m(\angle B) = 90°$

$\therefore (AB)^2 = (10)^2 - (8)^2 = 36$

$\therefore AB = 6$ cm.

$\therefore \sin^2 A + 1$

$= \left(\frac{8}{10}\right)^2 + 1 = \frac{41}{25} \qquad (1)$

, $2\cos^2 C + \cos^2 A = 2 \times \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2 = \frac{41}{25} \qquad (2)$

From (1) , (2) : $\therefore \sin^2 A + 1 = 2\cos^2 C + \cos^2 A$

[b] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{-1-1}{0-1} = 2$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{3+1}{2-0} = 2$

$\therefore m_1 = m_2 \qquad \therefore \overleftrightarrow{AB} \parallel \overleftrightarrow{BC}$

, ∵ B is a common point

∴ A , B , C are collinear.

3

[a] ∵ $\sin X \tan 30° = \sin^2 45°$

∴ $\sin X \times \frac{1}{\sqrt{3}} = \left(\frac{1}{\sqrt{2}}\right)^2$ ∴ $\sin X = \frac{\sqrt{3}}{2}$

∴ $X = 60°$

[b] ∵ $m_1 = \frac{4-3}{2+1} = \frac{1}{3}$, $m_2 = \frac{1}{3}$

∴ $m_1 = m_2$

∴ The two straight lines are parallel.

4

[a] ∵ $\sin 60° = \frac{\sqrt{3}}{2}$ (1)

, $2 \sin 30° \cos 30° = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) : ∴ $\sin 60° = 2 \sin 30° \cos 30°$

[b] ∵ $AB = \sqrt{(6-5)^2 + (-2-3)^2} = \sqrt{1+25}$

$= \sqrt{26}$ length units

, $BC = \sqrt{(1-6)^2 + (-1+2)^2} = \sqrt{25+1}$

$= \sqrt{26}$ length units

, $CD = \sqrt{(0-1)^2 + (4+1)^2} = \sqrt{1+25}$

$= \sqrt{26}$ length units

, $DA = \sqrt{(5-0)^2 + (3-4)^2} = \sqrt{25+1}$

$= \sqrt{26}$ length units

∴ AB = BC = CD = DA

∴ ABCD is a rhombus

, ∵ $AC = \sqrt{(1-5)^2 + (-1-3)^2} = \sqrt{16+16}$

$= 4\sqrt{2}$ length units

, $BD = \sqrt{(0-6)^2 + (4+2)^2} = \sqrt{36+36}$

$= 6\sqrt{2}$ length units

∴ The area of the rhombus $= \frac{1}{2}$ AC × BD

$= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2}$

= 24 square units.

5

[a] ∵ $AB = \sqrt{(3+3)^2 + (4-0)^2} = \sqrt{36+16}$

$= 2\sqrt{13}$ length units

, $BC = \sqrt{(1-3)^2 + (-6-4)^2} = \sqrt{4+100}$

$= 2\sqrt{26}$ length units

, $CA = \sqrt{(-3-1)^2 + (0+6)^2} = \sqrt{16+36}$

$= 2\sqrt{13}$ length units

∴ AB = AC

∴ Δ ABC is an isosceles triangle and its vertex is A

Let D be the midpoint of $\overline{BC}$ (The base of Δ ABC)

∴ $D = \left(\frac{3+1}{2}, \frac{4-6}{2}\right) = (2, -1)$

∴ $AD = \sqrt{(2+3)^2 + (-1-0)^2} = \sqrt{25+1}$

$= \sqrt{26}$ length units

∴ The length of the segment perpendicular to $\overline{BC}$ from A $= \sqrt{26}$ length units.

[b] ∵ The midpoint of $\overline{AC} = \left(\frac{3+0}{2}, \frac{2-3}{2}\right)$

$= \left(1\frac{1}{2}, -\frac{1}{2}\right)$

∴ The point of intersection of the two diagonals is $\left(1\frac{1}{2}, -\frac{1}{2}\right)$

and let D (X , y)

∵ The midpoint of $\overline{AC}$ = the midpoint of $\overline{BD}$

∴ $\left(1\frac{1}{2}, -\frac{1}{2}\right) = \left(\frac{X+4}{2}, \frac{y-5}{2}\right)$

∴ $\frac{X+4}{2} = 1\frac{1}{2}$ ∴ $X+4=3$ ∴ $X=-1$

, $\frac{y-5}{2} = -\frac{1}{2}$ ∴ $y-5=-1$ ∴ $y=4$

∴ D(− 1 , 4)

21 Luxor

1

1 b	2 c	3 c	4 b	5 d	6 c

2

[a] ∵ $\sqrt{(3a-1-a)^2 + (1-5)^2} = 5$ (Squaring both sides)

∴ $(2a-1)^2 + (-4)^2 = 25$

∴ $4a^2 - 4a + 1 + 16 - 25 = 0$

∴ $4a^2 - 4a - 8 = 0$ ∴ $a^2 - a - 2 = 0$

∴ $(a-2)(a+1) = 0$ ∴ a = 2 or a = − 1

[b] ∵ $3 \tan X - 4 \sin^2 30° = 8 \cos^2 60°$

∴ $3 \tan X - 4 \times \left(\frac{1}{2}\right)^2 = 8 \times \left(\frac{1}{2}\right)^2$

∴ $3 \tan X = 2 + 1$ ∴ $\tan X = 1$ ∴ $X = 45°$

3

[a] $\because$ The slope of the given straight line $= \frac{-2}{3}$

$\therefore$ The slope of the required straight line $= \frac{-2}{3}$

$\therefore$ Its equation is : $y = \frac{-2}{3} X + c$

, $\because$ (1 , 2) satisfies the equation.

$\therefore 2 = \frac{-2}{3} \times 1 + c$ $\quad \therefore c = \frac{8}{3}$

$\therefore$ The equation is : $y = \frac{-2}{3} X + \frac{8}{3}$

[b] $\because m = \frac{4\sqrt{3} - \sqrt{3}}{1 + 2} = \sqrt{3}$ $\quad \therefore \tan \theta = \sqrt{3}$ $\quad \therefore \theta = 60°$

4

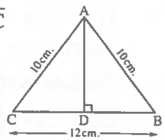
[a] $\because AB = \sqrt{(-2-4)^2 + (7+1)^2} = \sqrt{36 + 64}$

$= 10$ length units

$\therefore r = \frac{1}{2} AB = 5$ length units

$\therefore$ The area $= 3.14 \times (5)^2 = 78.5$ square units.

[b] 1 $\because AB = AC$, $\overline{AD} \perp \overline{BC}$



$\therefore BD = CD = 6$ cm.

In ΔADC :

$\because m(\angle ADC) = 90°$

$\therefore (AD)^2 = (10)^2 - (6)^2 = 64$

$\therefore AD = 8$ cm.

$\therefore \sin^2 C + \cos^2 C = \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2 = 1$

2 $\because m(\angle B) = m(\angle C)$ $\quad \therefore \sin B = \sin C$

$\therefore \sin B + \cos C = \sin C + \cos C$

$= \frac{8}{10} + \frac{6}{10} = \frac{14}{10} > 1$

5

[a] $\because \overleftrightarrow{AB}$ // y-axis $\quad \therefore 3 - X = 0$ $\quad \therefore X = 3$

[b] 1 In ΔAMB : $\because m(\angle AMB) = 90°$

$\therefore \cos(\angle BAM) = \frac{4}{5}$

$\therefore m(\angle BAC) \simeq 36° 52' 12''$

$\therefore m(\angle BAD) = 73° 44' 24''$

2 $\because (BM)^2 = (5)^2 - (4)^2 = 9$ $\quad \therefore BM = 3$ cm.

$\therefore$ The area $= \frac{1}{2} \times 8 \times 6 = 24$ cm^2.

22 Aswan

1

1 c   2 b   3 d   4 c   5 c   6 b

2

[a] $\because 2 \sin X = \tan^2 60° - 2 \tan^2 45°$

$\therefore 2 \sin X = \left(\sqrt{3}\right)^2 - 2 \times (1)^2$ $\quad \therefore 2 \sin X = 1$

$\therefore \sin X = \frac{1}{2}$ $\quad \therefore X = 30°$

[b] $\because$ The slope of $\overleftrightarrow{AB} = \frac{5-3}{3-1} = 1$

$\therefore$ The slope of the required straight line $= -1$

$\therefore$ Its equation is : $y = -X + c$

, $\because$ the midpoint of $\overline{AB} = \left(\frac{1+3}{2} , \frac{3+5}{2}\right)$

$= (2 , 4)$

, the required straight line passes through the midpoint of $\overline{AB}$

$\therefore 4 = -2 + c$ $\quad \therefore c = 6$

$\therefore$ The equation of the required straight line is :

$y = -X + 6$

3

[a] $\because (4 , 2) = \left(\frac{2+6}{2} , \frac{4+y}{2}\right)$

$\therefore \frac{4+y}{2} = 2$ $\quad \therefore 4 + y = 4$ $\quad \therefore y = 0$

[b] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{3+1}{2+1} = \frac{4}{3}$

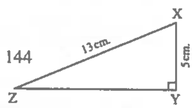
, the slope of $\overleftrightarrow{BC} = m_2 = \frac{0-3}{6-2} = \frac{-3}{4}$

$\therefore m_1 \times m_2 = \frac{4}{3} \times \frac{-3}{4} = -1$ $\quad \therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

$\therefore \Delta ABC$ is right-angled at B

4

[a] $\because m(\angle Y) = 90°$



$\therefore (YZ)^2 = (13)^2 - (5)^2 = 144$

$\therefore YZ = 12$ cm.

1 $\tan X \tan Z = \frac{12}{5} \times \frac{5}{12} = 1$

2 $\cos X \cos Z - \sin X \sin Z$

$= \frac{5}{13} \times \frac{12}{13} - \frac{12}{13} \times \frac{5}{13} = 0$

[b] $\because$ The straight line passes through the points (1 , 0) , (0 , 4)

$\therefore$ Its slope $= \frac{4-0}{0-1} = -4$

$\therefore$ Its equation is : $y = -4X + c$

, $\because$ the straight line intercepts 4 units from the positive part of y-axis

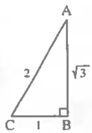
$\therefore$ Its equation is : $y = -4X + 4$

5

[a] $\because m_1 = \frac{3-4}{-1-2} = \frac{1}{3}$, $m_2 = \frac{1}{3}$ $\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

[b] $\because 2\,AB = \sqrt{3}\,AC$ $\therefore \frac{AB}{AC} = \frac{\sqrt{3}}{2}$



Let $AB = \sqrt{3}$ length units

, $AC = 2$ length units

$\therefore BC = 1$ length units

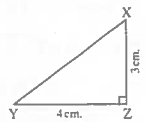
$\therefore \sin C = \frac{\sqrt{3}}{2}$, $\cos C = \frac{1}{2}$, $\tan C = \sqrt{3}$

23 New Valley

1

1 d 2 b 3 c 4 a 5 d 6 c

2



[a] $\because m(\angle Z) = 90°$

$\therefore (XY)^2 = (3)^2 + (4)^2 = 25$

$\therefore XY = 5$ cm.

1 $\tan X \tan Y = \frac{4}{3} \times \frac{3}{4} = 1$

2 $\sin^2 X + \cos^2 X = \left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2 = 1$

[b] $\because AB = \sqrt{(1-3)^2 + (5-3)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units

, $BC = \sqrt{(1-1)^2 + (3-5)^2} = \sqrt{0+4}$

$= 2$ length units

, $AC = \sqrt{(1-3)^2 + (3-3)^2} = \sqrt{4+0}$

$= 2$ length units

$\therefore BC = AC$

$\therefore \Delta ABC$ is an isosceles triangle

, $\because (AB)^2 = \left(2\sqrt{2}\right)^2 = 8$

, $(BC)^2 + (AC)^2 = (2)^2 + (2)^2 = 8$

$\therefore (AB)^2 = (BC)^2 + (AC)^2$

$\therefore \Delta ABC$ is a right-angled triangle at C

3

[a] 1 $\because \tan X = 4 \sin 30° \cos 60°$

$\therefore \tan X = 4 \times \frac{1}{2} \times \frac{1}{2} = 1$ $\therefore X = 45°$

2 $\sin 45° = \frac{1}{\sqrt{2}}$

[b] $\because$ The slope of the straight line = 2

$\therefore$ Its equation is : $y = 2X + c$

, $\because (1 , 0)$ satisfies the equation.

$\therefore 0 = 2 \times 1 + c$ $\therefore c = -2$

$\therefore$ The equation is : $y = 2X - 2$

4

[a] 1 $\because AB = AC$, $\overline{AD} \perp \overline{BC}$

$\therefore BD = CD = 6$ cm.

In ΔADB : $\because m(\angle ADB) = 90°$

$\therefore \cos B = \frac{6}{10} = \frac{3}{5}$

2 $m(\angle B) \simeq 53° \, 7' \, 48''$

3 $\because \sin(90° - B) = \cos B$

$\therefore \sin(90° - B) = \frac{3}{5}$

[b] 1 $\because$ The midpoint of $\overline{AC} = \left(\frac{-2+4}{2} , \frac{3-3}{2}\right)$

$= (1 , 0)$

$\therefore$ The point of intersection of the diagonals $= (1 , 0)$

2 Let $D(X , y)$

$\therefore (1 , 0) = \left(\frac{-1+X}{2} , \frac{-2+y}{2}\right)$

$\therefore \frac{-1+X}{2} = 1$ $\therefore -1 + X = 2$ $\therefore X = 3$

, $\frac{-2+y}{2} = 0$ $\therefore -2 + y = 0$ $\therefore y = 2$

$\therefore D(3 , 2)$

5

[a] $\because L_1 \parallel L_2$ $\therefore m_1 = m_2$ $\therefore \frac{k-1}{3-2} = \tan 45°$

$\therefore k - 1 = 1$ $\therefore k = 2$

[b] $\because$ The straight line passes through $(2 , 0)$, $(0 , 4)$

$\therefore$ Its slope $= \frac{4-0}{0-2} = -2$

$\therefore$ Its equation is : $y = -2X + c$

, $\because$ the straight line intercepts 4 units from the positive part of y-axis

$\therefore$ Its equation is : $y = -2X + 4$

24 South Sinai

1

1 a 2 b 3 c 4 d 5 a 6 c

2

[a] $\because \cos 60^\circ = \frac{1}{2}$ (1)

, $\cos^2 30^\circ - \sin^2 30^\circ = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{1}{2}$ (2)

From (1) , (2) : $\therefore \cos 60^\circ = \cos^2 30^\circ - \sin^2 30^\circ$

[b] Let B (X , y)

$\therefore (1 , -3) = \left(\frac{4+X}{2} , \frac{-3+y}{2}\right)$

$\therefore \frac{4+X}{2} = 1$ $\therefore 4 + X = 2$ $\therefore X = -2$

, $\frac{-3+y}{2} = -3$ $\therefore -3 + y = -6$ $\therefore y = -3$

$\therefore$ B $(-2 , -3)$

3

[a] $\because$ The slope of the straight line $= \frac{-3-3}{-1-1} = 3$

$\therefore$ Its equation is : $y = 3X + c$

, $\because$ (1 , 3) satisfies the equation.

$\therefore 3 = 3 \times 1 + c$ $\therefore c = 0$

$\therefore$ The equation is : $y = 3X$

[b] $\because AB = \sqrt{(1-3)^2 + (5-3)^2} = \sqrt{4+4}$

$= 2\sqrt{2}$ length units

, $BC = \sqrt{(1-1)^2 + (3-5)^2} = \sqrt{4}$

$= 2$ length units

, $AC = \sqrt{(1-3)^2 + (3-3)^2} = \sqrt{4} = 2$ length units

$\therefore BC = AC$

$\therefore \Delta ABC$ is an isosceles triangle.

4

[a] $\because$ The slope of the straight line $= \tan 45^\circ = 1$

$\therefore$ Its equation is : $y = X + c$

, $\because (-2 , 3)$ satisfies the equation.

$\therefore 3 = -2 + c$ $\therefore c = 5$

$\therefore$ The equation is : $y = X + 5$

[b] $\frac{2 \tan 45^\circ}{1 + \tan^2 45^\circ} = \frac{2 \times 1}{1 + (1)^2} = 1$

5

[a] $\because$ The slope of the straight line is 2 and it intersects 5 units from the positive part of the y-axis

$\therefore$ Its equation is : $y = 2X + 5$

[b] 1 $\because m(\angle B) = 90^\circ$ $\therefore \sin C = \frac{5}{10} = \frac{1}{2}$

$\therefore m(\angle C) = 30^\circ$

2 $\sin^2 C + \cos^2 C = \sin^2 30^\circ + \cos^2 30^\circ$

$= \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 = 1$

25 North Sinai

1

1 d 2 c 3 a 4 c 5 d 6 c

2

[a] $\because \cos 60^\circ = \frac{1}{2}$ (1)

, $2\cos^2 30^\circ - 1 = 2 \times \left(\frac{\sqrt{3}}{2}\right)^2 - 1$

$= 2 \times \frac{3}{4} - 1 = \frac{1}{2}$ (2)

From (1) , (2) : $\therefore \cos 60^\circ = 2\cos^2 30^\circ - 1$

[b] $\because AB = \sqrt{(-4-1)^2 + (2+2)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

, $BC = \sqrt{(1+4)^2 + (6-2)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

, $AC = \sqrt{(1-1)^2 + (6+2)^2} = \sqrt{64}$

$= 8$ length units

$\therefore AB = BC$

$\therefore \Delta ABC$ is an isosceles triangle.

3

[a] $\because$ The slope of the straight line = 2 and it cuts 7 units from the positive part of the y-axis

$\therefore$ Its equation is : $y = 2X + 7$

[b] 1 $\because m(\angle B) = 90^\circ$

$\therefore (AB)^2 = (10)^2 - (8)^2 = 36$

$\therefore AB = 6$ cm.

2 $\sin^2 A + \cos^2 A = \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2$

$= \frac{64}{100} + \frac{36}{100} = 1$

4

[a] $\because \cos X = \frac{\sin 60° \sin 30°}{\sin^2 45°}$ $\therefore \cos X = \frac{\frac{\sqrt{3}}{2} \times \frac{1}{2}}{\left(\frac{1}{\sqrt{2}}\right)^2}$

$\therefore \cos X = \frac{\sqrt{3}}{2}$ $\therefore X = 30°$

[b] $\because$ The slope of the given straight line $= \frac{-4+3}{5-2}$

$= \frac{-1}{3}$

$\therefore$ The slope of the required straight line $= 3$

$\therefore$ Its equation is : $y = 3X + c$

, $\because$ (1 , 2) satisfies the equation.

$\therefore 2 = 3 \times 1 + c$ $\therefore c = -1$

$\therefore$ The equation is : $y = 3X - 1$

5

1 $\because MA = \sqrt{(-1-3)^2 + (2+1)^2} = \sqrt{16+9}$

$= 5$ length units

, $MB = \sqrt{(-1+4)^2 + (2-6)^2} = \sqrt{9+16}$

$= 5$ length units

and $MC = \sqrt{(-1-2)^2 + (2+2)^2} = \sqrt{9+16}$

$= 5$ length units

$\therefore MA = MB = MC$

$\therefore$ A , B and C lie on the circle M

2 The circumference of the circle $= 2 \times 3.14 \times 5$

$= 31.4$ length units.

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1

1 b 2 c 3 a 4 c 5 b 6 d

2

[a] $\because \sin 60° = \frac{\sqrt{3}}{2}$ (1)

, $2 \sin 30° \cos 30° \tan 45° = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2} \times 1$

$= \frac{\sqrt{3}}{2}$ (2)

From (1) , (2) :

$\therefore \sin 60° = 2 \sin 30° \cos 30° \tan 45°$

[b] $\because$ The slope of the straight line $= \frac{-1-2}{-2-4} = \frac{1}{2}$

$\therefore$ Its equation is : $y = \frac{1}{2}X + c$

, $\because$ (4 , 2) satisfies the equation.

$\therefore 2 = \frac{1}{2} \times 4 + c$ $\therefore c = 0$

$\therefore$ The equation is : $y = \frac{1}{2}X$

3

[a] $\because \tan X = 4 \cos 60° \sin 30°$

$\therefore \tan X = 4 \times \frac{1}{2} \times \frac{1}{2}$

$\therefore \tan X = 1$ $\therefore X = 45°$

[b] $\because AB = \sqrt{(-3-2)^2 + (0-4)^2} = \sqrt{25+16}$

$= \sqrt{41}$ length units

, $BC = \sqrt{(-7+3)^2 + (5-0)^2} = \sqrt{16+25}$

$= \sqrt{41}$ length units

, $AC = \sqrt{(-7-2)^2 + (5-4)^2} = \sqrt{81+1}$

$= \sqrt{82}$ length units

$\therefore (AC)^2 = (AB)^2 + (BC)^2$

$\therefore \Delta ABC$ is a right-angled triangle at B

, its area $= \frac{1}{2} \times \sqrt{41} \times \sqrt{41} = 20\frac{1}{2}$ square units.

4

[a] $\because$ The slope of the straight line $= 2$ and it intercepts 7 units from the positive part of the y-axis

$\therefore$ Its equation is : $y = 2X + 7$

[b] $\because m(\angle B) = 90°$

$\therefore (AB)^2 = (13)^2 - (5)^2 = 144$

$\therefore AB = 12$ cm.

$\therefore \sin A \cos C + \cos A \sin C$

$= \frac{5}{13} \times \frac{5}{13} + \frac{12}{13} \times \frac{12}{13} = 1$

5

[a] $\because \sqrt{(X+2)^2 + (7-3)^2} = 5$ (Squaring both sides)

$\therefore (X+2)^2 + (7-3)^2 = 25$

$\therefore X^2 + 4X + 4 + 16 - 25 = 0$

$\therefore X^2 + 4X - 5 = 0$ $\therefore (X+5)(X-1) = 0$

$\therefore X = -5$ or $X = 1$

[b] $\because L_1 // L_2$ $\therefore m_1 = m_2$

$\therefore \frac{k-1}{2-3} = \tan 45°$ $\therefore -k+1 = 1$

$\therefore k = 0$

27 Matrouh

1

1 b 2 a 3 a 4 c 5 a 6 d

2

[a] $\because \tan 60° = \sqrt{3}$ (1)

$, \frac{2\tan 30°}{1-\tan^2 30°} = \frac{2 \times \frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}} = \sqrt{3}$ (2)

From (1) , (2) :

$\therefore \tan 60° = \frac{2\tan 30°}{1-\tan^2 30°}$

[b] $\because$ The slope of $\overleftrightarrow{AB} = m_1 = \frac{-4-0}{2-6} = 1$

, the slope of $\overleftrightarrow{BC} = m_2 = \frac{2+4}{-4-2} = -1$

$\therefore m_1 \times m_2 = 1 \times -1 = -1$

$\therefore \overleftrightarrow{AB} \perp \overleftrightarrow{BC}$

$\therefore \Delta$ ABC is a right-angled triangle at B

3

[a] $\because \sqrt{(a+2)^2+(7-3)^2} = 5$ (Squaring both sides)

$\therefore (a+2)^2+(7-3)^2 = 25$

$\therefore a^2+4a+4+16-25 = 0$

$\therefore a^2+4a-5 = 0$ $\therefore (a+5)(a-1) = 0$

$\therefore a = -5$ or $a = 1$

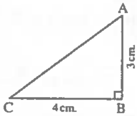
[b] $\because m(\angle B) = 90°$

$\therefore (AC)^2 = (3)^2+(4)^2 = 25$

$\therefore AC = 5$ cm.

$\therefore \sin A \cos C + \cos A \sin C$

$= \frac{4}{5} \times \frac{4}{5} + \frac{3}{5} \times \frac{3}{5} = 1$



4

[a] Let $A = x°$, $B = 2x°$

$\therefore x + 2x = 90°$ $\therefore 3x = 90°$

$\therefore x = 30°$ $\therefore A = 30°$, $B = 60°$

$\therefore \sin A + \cos B = \sin 30° + \cos 60°$

$= \frac{1}{2} + \frac{1}{2} = 1$

[b] $\because \frac{x}{2} + \frac{y}{2} = 1$ (Multiplying by 2)

$\therefore x + y = 2$

$\therefore$ The slope $= -1$

, the intercepted part = 2 units from the positive part of y-axis.

5

[a] $\because (-3 , y) = \left(\frac{x+9}{2} , \frac{-6-12}{2}\right)$

$\therefore y = -9$

$, \frac{x+9}{2} = -3$ $\therefore x + 9 = -6$

$\therefore x = -15$

[b] $\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line $= \frac{-1}{2}$

$\therefore$ Its equation is : $y = \frac{-1}{2}x + c$

, $\because (3 , -5)$ satisfies the equation.

$\therefore -5 = \frac{-1}{2} \times 3 + c$ $\therefore c = \frac{-7}{2}$

$\therefore$ The equation is : $y = \frac{-1}{2}x - \frac{7}{2}$